westonandsampson.com

WESTON & SAMPSON ENGINEERS, INC.
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CONTRACT DOCUMENTS

October 2024

TOWN OF
Abington
MASSACHUSETTS

Phase I – Salt Shed, Fuel Island, and Associated Site Work

225 Central Street,
Abington, MA 02351

BIDDING

October 16, 2024

REGISTERED ARCHITECT
BRIAN MCCUSKER
No. 952455
PLAINVILLE
MA.
COMMONWEALTH OF MASSACHUSETTS

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A. Phase I - Salt Shed, Fuel Island and Associated Site Work

B. 225 Central Street Abington, MA 02351

C. Owner: Town of Abington / Department of Public Works

D. Architect Project No. ENG22-0465

E. Weston & Sampson℠
transform your environment

F. Weston & Sampson Engineers, Inc

G. 100 Foxborough, Blvd, Suite 250

H. Foxborough, MA 02035

I. Phone: 508-698-3034

J. Website: www.westonandsampson.com

K. Issued: October 16, 2024 - BIDDING

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END OF DOCUMENT

SECTION 00 11 13

ADVERTISEMENT FOR BIDS

Town of Abington, Massachusetts
(Owner)

Sealed bids for construction of Phase I – Salt Shed, Fuel Island, and Associated Site Work for the Town of Abington, Massachusetts, will be received at the Office of the Clerk, Town Hall, 500 Gliniewicz Way, Abington, MA 02351, until prevailing time, on November 20th at 11 am, at which time and place said bids will be publicly opened and read aloud.

The scope of work includes construction of

A fabric membrane tension salt structure with concrete retaining walls, a separate above ground tank fuel island and all associated site work and utilities.

Estimated construction cost: $4,000,000

General Contractor's CATEGORY OF CERTIFICATION: General Building Construction

Filed sub-bids for the trades in Item 2A & 2B in Section 00 41 13 FORM OF GENERAL BID shall be addressed to the Office of the Clerk, and endorsed to identify its contents and will be received at the Town Hall, 500 Gliniewicz Way, Abington, MA 02351, until November 6th at 11 AM at which time and place said sub-bids will be publicly opened and read aloud.

Bid security for all general bidders and sub-bidders in the form of a bid bond, cash, certified check, treasurer's or cashier's check, payable to the Owner, is required in the amount of 5 percent of the total bid, in accordance with the conditions in Section 00 21 13 INSTRUCTIONS TO BIDDERS.

SUB-BIDS

Item	Sub-bid	Specification Section
2A	Waterproofing, Damp-proofing, and Caulking	07 00 01
2B	Electrical	26 00 00

The Instructions to Bidders, Form of General Bid, Agreement, Plans, Specifications, Performance and Payment Bond, and other Contract Documents may be examined at the following:

Weston & Sampson Engineers, Inc., Foxboro, Massachusetts

Accent Printing, Inc., 99 Chelmsford Road, North Billerica, Massachusetts

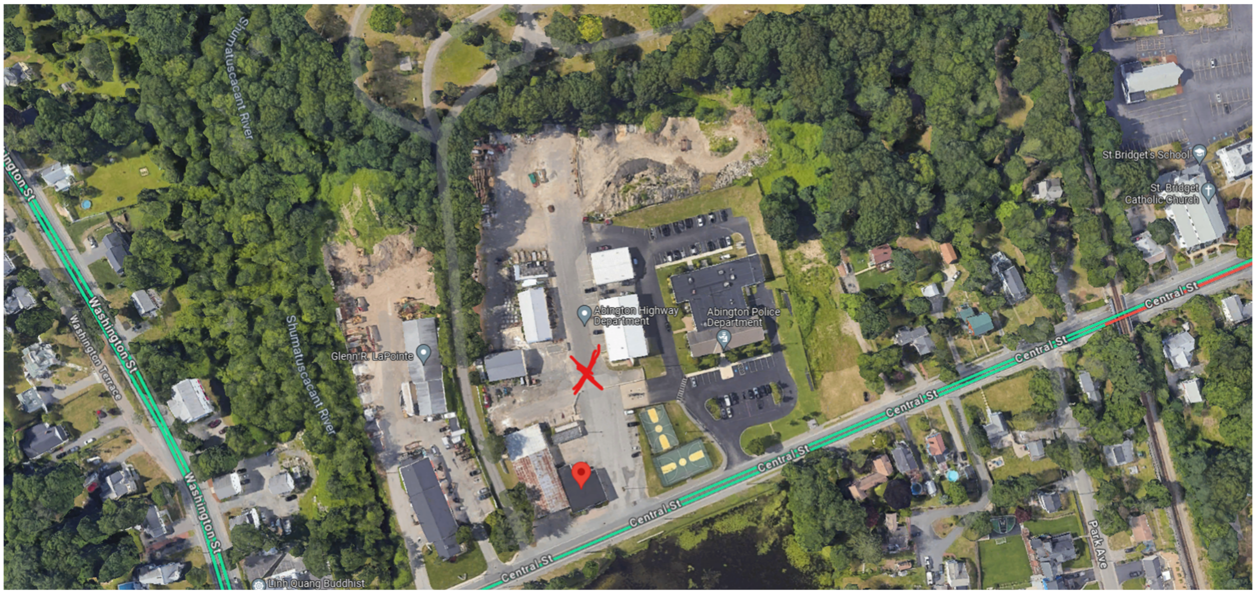
Contract Documents may be viewed and downloaded as a Portable Document Format (PDF) file free of charge at www.accentblueprints.com starting 10.16.24. Copies may be obtained for a fee by completing an order online or by calling 978-362-8038 for each set. Completed orders may be picked up at the office of Accent Printing located at 99 Chelmsford Road, North Billerica, MA 01862 (978-362-8038), from 9 a.m. to 4 p.m. Copies may also be shipped to prospective bidders for an additional charge to cover handling and mailing fees. All payments for printing and shipping are nonrefundable. For addition to the project plan holder's list to guarantee receipt of addenda, it is recommended interested bidders obtain the Contract Documents directly from Accent. Interested bidders will be prompted to register an email address with Accent to access the documents.

The selected contractor shall furnish a performance bond and a payment bond in amount at least equal to one hundred percent (100%) of the contract price as stipulated in Section 00 72 00 GENERAL CONDITIONS of these specifications.

General Contractors shall file their bids with a copy of the certificate from Division of Capital Asset Management and Maintenance (DCAMM) showing that they are eligible to bid on projects of this category, of this estimated project dollar amount and up to an aggregate limit, and with an Update Statement, DCAM Form CQ3 **Section 00 41 13-Attachment** and Certificate of Eligibility, DCAM Form CQ7.

Subcontractors shall file with their sub-bids a copy of their DCAMM Certificate of Eligibility and Sub-Bidders Update Statement.

A Non-Mandatory Prebid Conference will be held on October 24, 2024, 9 am at the project site, 225 Central Street, Abington, MA. Location marked below in the "X".



Any request for interpretation of plans and specifications may be submitted in writing at that time. Bidders will have an opportunity to view the site of the work following the Prebid Conference.

*All bids for this project are subject to applicable bidding laws of Massachusetts, including General Laws Chapter 149, Section 44A to 44J inclusive, as amended.

Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provisions of the Massachusetts General Laws Chapter 149, Section 26 to 27H, as amended, apply to this project. It is the responsibility of the Bidder, before bid opening, to request if necessary, any additional information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

By submission of a bid, the Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded after the opening of bids.

The Owner reserves the right to waive any informalities in bids and to reject any or all bids.

TOWN OF ABINGTON, MASSACHUSETTS

BY ITS

SELECTBOARD

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

1. Receipt and Opening of Bids
2. Location and Work to be Done
3. Deposit on Documents
4. Preparation of Bid
5. Modification of Bids
6. Obligation of Bidder
7. Information not Guaranteed
8. Bid Security
9. Time for Completion
10. Addenda and Interpretations
11. Bid Opening Procedure
12. Comparison of Bids
13. Statutes Regulating Competitive Bidding
14. Right to Reject Bid
15. Ability and Experience of Bidder
16. Conditions of Work
17. Security for Faithful Performance
18. Power of Attorney
19. Laws and Regulations
20. Liquidated Damages for Failure to Enter into Contract
21. Indeterminate Items and Estimated Quantities
22. CONTRACTOR Records
23. Bidder Certification – OSHA Training
24. Report of Sub-bids
25. Prevailing Wage Rates

1. Receipt and Opening of Bids

The Town of Abington herein called the OWNER, acting by and through its Select Board will receive sealed Bids for the construction of ***Phase I – Salt Shed, Fuel Island, and Associated Site Work.***

Such bids addressed to the Office of the Clerk, and endorsed to identify its contents and will be received at the Town Hall, 500 Gliniewicz Way, Abington, MA 02351, until prevailing time on November 20th, 2024 at 11 am, at which time and place said bids will be publicly opened and read aloud.

Filed sub-bids for the trades in Item 2A WATERPROOFING, DAMP-PROOFING, AND CAULKING & 2B ELECTRICAL, in Section 00 43 13 FORM OF GENERAL BID shall be addressed to the Office of the Clerk, and endorsed to identify its contents and will be received at the Town Hall, 500 Gliniewicz Way, Abington, MA 02351, until November 6th, 2024 at 11 AM at which time and place said sub-bids will be publicly opened and read aloud.

If the building at which bids are to be received is closed for any reason on the date and time that bids are due, receipt of bids by the Owner will be postponed until the next business day at the time originally stated for receipt of bids.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. By submission of a bid, the bidder agrees that this bid shall be good and may not be withdrawn for the number of days, after the opening of bids, as stipulated in the FORM OF GENERAL BID.

2. Location and Work to be Done

The location, general characteristics, and principal details of the Work are indicated on a set of 27 drawings titled "Phase I – Salt Shed, Fuel Island, and Associated Site Work".

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum from time to time during the bidding period by the ENGINEER, and shall then become a part of the Contract Documents.

The CONTRACTOR shall furnish all superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

3. Deposit on Documents

A deposit, in the amount as specified in Section 00 11 13, ADVERTISEMENT FOR BIDS, in cash or check payable to Weston & Sampson Engineers, Inc. will be required on each set of Contract Documents taken. Such deposits will be refunded to all bidders and non-bidders upon the return of said documents in good condition within 30 days after the date of opening of general bids.

To ensure refund of the deposit, Contract Documents (except documents submitted by bidders) must be returned to the office of Weston & Sampson and be accompanied by a letter of transmittal.

4. Preparation of Bid

Each bid must be submitted on the prescribed form in Section 00 41 13. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

General Contractors shall file their bids with a copy of the certificate from Division of Capital Asset Management and Maintenance (DCAMM) showing that they are eligible to bid on projects of this category, of this estimated project dollar amount and up to an aggregate limit, and with an Update Statement, DCAM Form CQ3 and Certificate of Eligibility, DCAM Form CQ7.

Subcontractors shall file with their sub-bids a copy of their DCAMM Certificate of Eligibility and Sub-Bidders Update Statement.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, its address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above.

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

5. Modification of Bids

Any bidder may modify its bid by written communication at any time prior to the scheduled closing time for receipt of bids. Any telegraphic communication must be received by the OWNER prior to the closing time, and, provided further, for any telegraphic communication that modifies a bid the OWNER is satisfied that a written confirmation of the modification over the signature of the bidder was mailed prior to the closing time.

The modification communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the OWNER until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the facsimile transmission.

6. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of its bid.

7. Information not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the OWNER. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the OWNER does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

It is further agreed and understood that no bidder or CONTRACTOR shall use or be entitled to use any of the information made available to it or obtained in any examination made by it in any manner as a basis of or grounds for any claim or demand against the OWNER or the ENGINEER, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

8. Bid Security

Each bid must be accompanied by a certified check, a bid bond, cash, a treasurer's or cashier's check, payable to the OWNER, in the amount stated in Section 00 11 13, ADVERTISEMENT FOR BIDS. Such deposits will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining deposits will be returned promptly after the OWNER and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to any bidder within 30 days, Saturdays, Sundays and legal holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

All bid deposit checks of sub-bidders except those of the sub-bidders named in the general bids of the three lowest responsible and eligible general bidders and those of the three lowest responsible and eligible sub-bidders for each subtrade, shall be returned within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of the general bids. The bid deposit checks of sub-bidders not returned pursuant to the provisions of the preceding sentence will be returned within five days, Saturdays, Sundays, and legal holidays excluded, after the execution of the general contract; except that, if a selected sub-bidder fails to perform its agreement to execute a subcontract with the general bidder selected as the general CONTRACTOR, contingent upon the execution of the general contract, or fails to furnish the performance and payment bond stated in its sub-bid if requested in the general bid, its bid security shall be forfeited.

9. Time for Completion

The successful general bidder must agree to commence work on or before a date to be specified in the written "Notice to Proceed" from the OWNER and to fully complete the project within the time limit stated in Section 00 43 13, FORM OF GENERAL BID.

10. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other prebid documents will be made to any bidder orally, and if provided orally, shall not be relied upon by bidders unless confirmed in a written addendum. All information given to bidders other than by means of the plans, specifications, or by addenda, as described below, is given informally and shall not be used as the basis of a claim against the OWNER or the ENGINEER.

Every request for such interpretation should be in writing (typed, not handwritten) addressed to Weston & Sampson Engineers, Inc., 55 Walkers Brook Drive, Reading, Massachusetts 01867 Attention: CSD, or sent via email to **Sarah Foley, foleys@wseinc.com** and to be given consideration must be received at least ten working days prior to the date fixed for the opening of bids.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, when issued, may be viewed and downloaded as a Portable Document File (PDF) at www.accentblueprints.com. A notification of addenda will be emailed to all prospective bidders to email addresses furnished by them for such purposes. Bidders picking up sets of bid documents will be given all addenda issued to date and will be required to sign for all documents, acknowledging receipt. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under its bid as submitted, and each bidder must confirm for itself that it has received all addenda. All addenda so issued shall become part of the Contract Documents.

11. Bid Opening Procedure

The following list of requirements shall be met by each filed bid.

Bids shall be filed at the place and before the time specified in Receipt and Opening of Bids, above.

Properly executed bid security shall be placed in a sealed envelope and shall be attached to the outside of the envelope containing the bid.

The bid and all accompanying documents so required shall be signed by the Bidder or its authorized representative before submission.

All bidders shall include with their bids written acknowledgment of receipt of all addenda. Refer to acknowledgment form provided in Section 00 43 13 **,** FORM OF GENERAL BID and Section 00 43 13.13, FORM OF SUB-BID, if applicable.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may examine all bids after the bid opening and after the reading of the three apparent low bids except for the DCAMM Update Statements if contained therein, which are not public records.

12. Comparison of Bids

Bids will be compared on the basis of the quantities and unit and lump sum prices stated in the bid forms.

In the event that there is a discrepancy in Section 00 43 13, FORM OF GENERAL BID between the lump sum or unit prices written in words and figures, the prices written in words will govern.

The OWNER agrees to examine and consider each FORM OF GENERAL BID submitted in accordance with the terms and conditions set forth herein and as set forth in Section 00 43 13 , FORM OF GENERAL BID.

13. Statutes Regulating Competitive Bidding

Any bid, which does not comply with the provisions of Massachusetts General Laws Chapter 149, Sections 44A to 44J inclusive, as amended, need not be accepted and the OWNER may reject every such bid.

14. Right to Reject Bid

The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids, should the OWNER deem it to be in the public interest to do so.

The OWNER may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities, and may reject bids for any other reason permitted by law, or the OWNER may waive such omissions, conditions or irregularities.

15. Ability and Experience of Bidder

All general contractors shall file with their bids a copy of a certificate of eligibility from Division of Capital Asset Management and Maintenance (DCAMM) showing that they are eligible to bid on projects of this category, value, and up to an aggregate limit and an update statement, DCAMM Form CQ3 **Section 00 45 13.**

All subcontractors submitting filed sub-bids must include a valid DCAMM Certificate of Eligibility and completed Sub-Bidder Update Statement **Section 00 45 13.13** with their sub-bids.

No award will be made to any bidder who cannot satisfy the OWNER that it has sufficient ability and experience in this class of work and sufficient capital and plant to enable it to prosecute and complete the work successfully within the time named. The OWNER's decision or judgment on these matters will be final, conclusive, and binding to the fullest extent permitted by law.

The OWNER may make such investigations as it deems necessary, and the bidder shall furnish to the OWNER, under oath if so required, all such information and data for this purpose as the OWNER may request.

16. Conditions of Work

Each bidder must inform itself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of its obligation to furnish all material and labor necessary to carry out the provisions of its contract. Insofar as possible the CONTRACTOR, in carrying out its work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

17. Security for Faithful Performance

Simultaneously with its delivery of the executed Contract, the CONTRACTOR shall furnish a surety bond or bonds as security for faithful performance of this Contract and for the payment of all persons performing labor and materials under this Contract as specified in Section 00700, GENERAL CONDITIONS included herein, each in the amount of 100 percent of its bid. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the OWNER. The bonds shall remain in force for one year after final acceptance of the work by the OWNER, unless the OWNER, in writing, releases the CONTRACTOR from the obligation sooner.

18. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

19. Laws and Regulations

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where a conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

Attention is directed to Section 00 73 73.13 STATE REGULATIONS and to other applicable sections of this specification. In the event of any conflict between provisions of law or regulation quoted or paraphrased in the Contract Documents, the actual provisions of law or regulation shall control.

20. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon its failure or refusal to execute and deliver the Contract, Bonds and Certificates of Insurance required within 5 days, Saturdays, Sundays and legal holidays excluded, after presentment of the contract by the OWNER, shall, except as otherwise provided by applicable law, forfeit to the OWNER, as liquidated damages for such failure or refusal, the security deposited with its bid, provided that the amount forfeited shall not exceed the difference between its bid price and the bid price of the next lowest responsible and eligible bidder. In case of death, disability, bonafide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, its bid deposit will be returned.

21. Indeterminate Items and Estimated Quantities

The work to be done under this Contract has been divided into parts or items, if applicable, to enable each bidder to bid on different portions of the work in accordance with its estimate of their cost and so that the actual quantity of work executed under each item may be paid for at the price bid for that particular item, even though each bidder may have judged that such quantity may be greater or less than the estimated quantity stated in Section 00 41 13, FORM OF GENERAL BID.

22. CONTRACTOR Records

The CONTRACTOR shall comply with the provisions of Massachusetts General Laws, Chapter 30, Section 39R, concerning CONTRACTOR records. This section has been reprinted in Section 00 73 73.13, STATE REGULATIONS.

23. Bidder Certification – OSHA Training

All employees who work on Massachusetts public works construction sites, on projects estimated to cost more than $10,000, must have no less than ten (10) hours of OSHA-approved safety and health training.

The Massachusetts Attorney General is authorized to restrain award of construction contracts to any contractor who is in violation of this requirement and to restrain the performance of these contracts by non-complying contractors.

Noncompliance with this law will disqualify contractors from bidding on public contracts.

24. Report of Sub-bids

The OWNER will email all bidders who have taken out plans in accord with the advertisements, not later than the second day excluding Saturday, Sunday and legal holidays, before the day for opening of general bids, a list of those sub-bidders who have filed bids in complete conformance with the Massachusetts General Laws.

25. Prevailing Wage Rates

Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H, as amended, apply to this project. It is the responsibility of the bidder, before bid opening, to request if necessary, any additional information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

The Contractor is responsible for requesting up to date wage rates from the Owner prior to the one-year anniversary of the notice to proceed of this contract. The Owner shall obtain updated wage rates from the Director and provide them to the Contractor upon said request.

END OF SECTION

SECTION 00 31 33 - ENVIRONMENTAL SUBSURFACE DATA

PART I - GENERAL

1.1 SCOPE:

A. Subsurface explorations consisting of soil borings, test pits, and monitoring well installations have been performed, with reasonable care.

B. The following reports and results of the explorations are appended hereto:

1. Sample Location Plan
2. Table 1 and Table 2 - Summary of Soil Analytical Results.
3. Table 3 - Summary of Groundwater Analytical Results.
4. Test Pit and Borings Logs – Environmental

C. Laboratory analytical data for the site soil and groundwater samples are summarized in the data tables attached to this Section. Associated laboratory analytical reports summarized in the attached data tables are available upon request.

D. The attached soil and groundwater analytical data is provided for informational purposes only. The Contractor shall not rely on the interpretations, opinions, conclusions, or recommendations, only the factual data relative to the specific times, locations, and depths/elevations. Specific project requirements are referenced only in the drawings and specifications.

E. If Contractors deem the subsurface information insufficient, they may, after obtaining Owner's permission, carry out additional subsurface explorations, at no expense to the Owner.

F. Subsurface information provided in the Contract Documents is limited by the methods used for obtaining and expressing such data and is subject to various interpretations. The terms used to describe soils, rock, groundwater, and such other conditions are subject to local usage and individual interpretation.

G. Borings and test pits have been completed substantially at the locations indicated on the drawings and advanced to the depths shown on the logs. Soil information presented in the boring logs, as to classification, gradation, properties, density and consistency, is based on visual observation of recovered samples. Reported groundwater levels are those measured in the field at the particular location and at the time measurements were made, and do not necessarily represent permanent or seasonal groundwater elevations. Groundwater elevations may be affected by temperature, rainfall, tidal fluctuation, and other factors that may not have been present at the time the measurements were made. The Contractors should be aware that groundwater level fluctuations may affect methods of construction.

H. Subsurface exploration, soil and rock data are for the general information of the Contractors. The Contractors are obligated to examine the site, review boring and test pit logs, all available information and records of explorations, investigations and other pertinent data for the site, and then based upon their own interpretations and investigations decide the character of material to be encountered and excavated, the suitability of the materials to be used for backfilling and such other purposes, the groundwater conditions, difficulties or obstacles likely to be encountered, and other conditions affecting the work. The subsurface data is accurate only at the particular locations and times the subsurface explorations were made. No other warranty either expressed or implied by the Owner, Engineer or their agents is made as to the accuracy of the subsurface information and data shown on the drawings or presented in the Contract Documents.

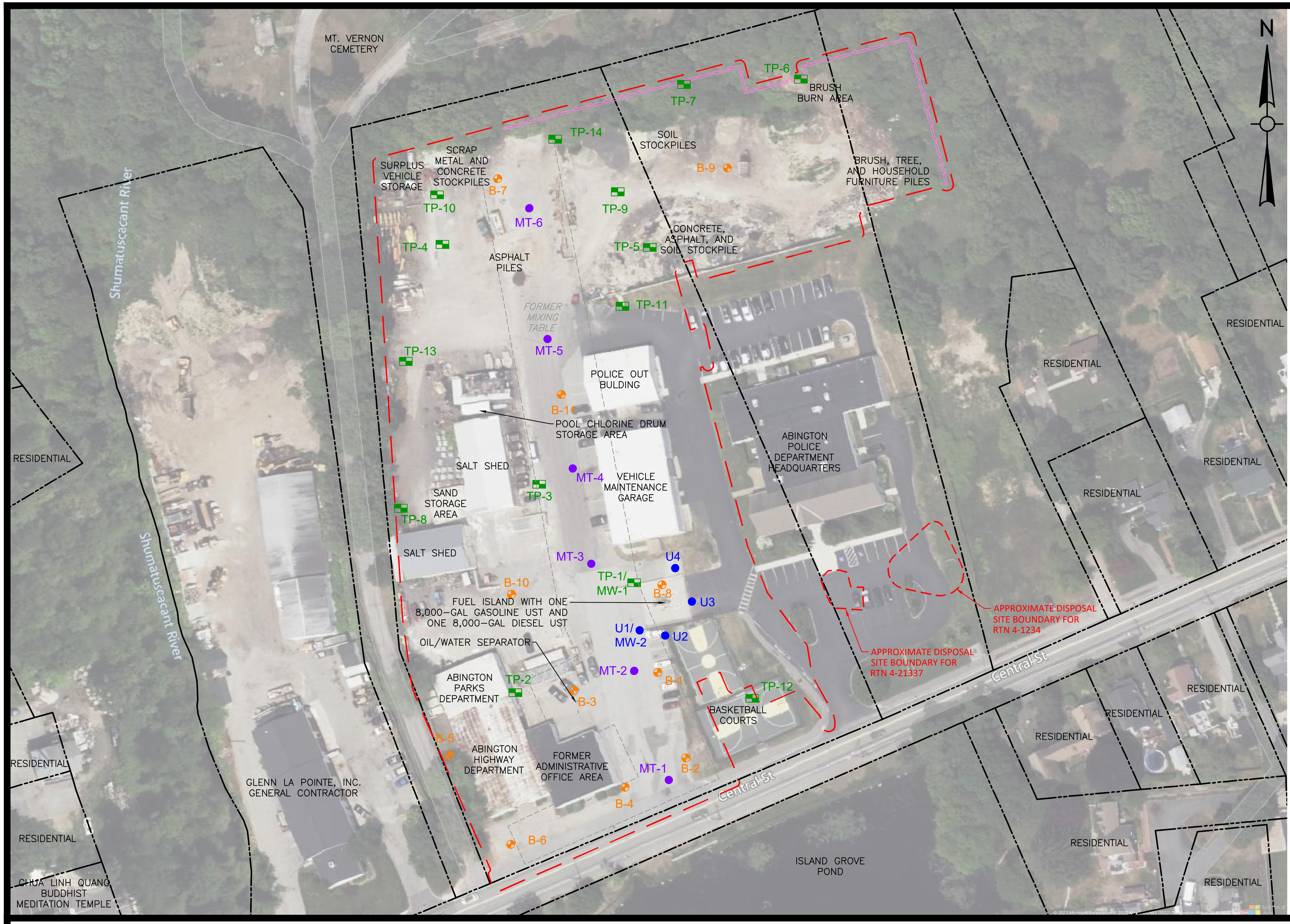
PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION



LEGEND:

- - - -	FORMER MIXING TABLE AREA
— — — —	DISPOSAL SITE BOUNDARIES FOR RTN 4-1234 AND 4-21337
—— ——	PROPOSED LIMIT OF WORK
● B-1	GEOTECHNICAL SOIL BORING LOCATION
🟩 TP-1	TEST PIT LOCATION
● U1	UNDERGROUND STORAGE TANK SOIL BORING LOCATION
● MT-1	MIXING TABLE SOIL BORING LOCATION

NOTES:

1. FORMER MIXING TABLE AREA IS REFERENCED FROM THE "ABINGTON HIGHWAY DEPT., PROPOSE LOCATION OF STATE FUNDED SALT STORAGE SHED. SCALE: 1" = 40'."
2. PROPERTY LINES ARE REFERENCED FROM MASSGIS MASSMAPPER.

Weston & Sampson℠

FIGURE 4
PROPOSED DPW & FIRE STATION
225 CENTRAL STREET, ABINGTON, MASSACHUSETTS

SAMPLE LOCATION PLAN

SCALE: 1"=100'

0 100 200

\\wse03.local\WSE\Projects\MA\Abington\ENG22-0465 DPW & Fire Station Design & Construction (With KBA)\Environmental\Figures\DWG\Site Plans_10.09.2023.dwg

Rev: 1.7 Date: 08/12/2019

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Table 1
Summary of Soil Analytical Results - Disposal Characterization
Abington Department of Public Works
225 Central Street
Abington, MA

Parameter	Units	MCP Reportable Concentrations (RCs)	DEP Comm-97 Disposal Criteria		Acceptance Criteria	Sample Identification
						Comp-1
		RCS-1	Lined Landfills	Unlined Landfills	Saugus Quarry	TP-1, TP-5, TP-6, TP-7, and TP-9 0-5'
						1/19/2023
Total Petroleun Hydrocarbons (TPH)						
TPH (C10-C36)	mg/kg	5,000	5,000	2,500	< 500	**223**
VOCs						
Tetrahydrofuran	mg/kg	500	NS	NS	< 50	**0.0057**
Total VOCs	mg/kg	NS	10	4	NS	**0.0057**
SVOCs						
Benzo(a)anthracene	mg/kg	7	NS	NS	< 7	**0.995**
Benzo(a)pyrene	mg/kg	2	NS	NS	< 2	**0.887**
Benzo(b)fluoranthene	mg/kg	7	NS	NS	< 7	**0.783**
Benzo(k)fluoranthene	mg/kg	70	NS	NS	< 70	**0.703**
Chrysene	mg/kg	70	NS	NS	< 70	**0.984**
Fluoranthene	mg/kg	1,000	NS	NS	< 1000	**2.07**
Indeno(1,2,3-cd)Pyrene	mg/kg	7	NS	NS	< 7	**0.637**
Phenanthrene	mg/kg	10	NS	NS	< 10	**1.10**
Pyrene	mg/kg	1,000	NS	NS	< 1000	**1.74**
Total SVOCs	mg/kg	NS	100	100	NS	**9.90**
PCBs						
Total PCBs	mg/kg	1	< 2	< 2	< 0.1	< 0.06
Total Metals						
Arsenic	mg/kg	20	40	40	< 20	**4.35**
Barium	mg/kg	1,000	NS	NS	< 1,000	**40.8**
Beryllium	mg/kg	90	NS	NS	< 90	**0.24**
Chromium	mg/kg	100	1,000	1,000	< 100	**7.64**
Lead	mg/kg	200	2,000	1,000	< 200	**78.7**
Nickel	mg/kg	600	NS	NS	< 600	**4.57**
Vanadium	mg/kg	400	NS	NS	< 400	**11.4**
Zinc	mg/kg	1,000	NS	NS	< 1,000	**78.4**
Pesticides						
4,4'-DDD	mg/kg	8	NS	NS	< 0.8	**0.0134**
4,4'-DDE	mg/kg	6	NS	NS	< 0.6	**0.0032 P, LC**
4,4'-DDT	mg/kg	6	NS	NS	< 0.6	**0.0105**
Herbicides						
Total Herbicides	mg/kg	NS	NS	NS	NS	ND
General Chemistry						
Conductivity	µmhos/cm	NS	8,000	4,000	< 2,000	**WL 249**
Corrosivity (pH)	S.U.	NS	NS	NS	5.0 - 9.0	**7.37**
Flashpoint	°F	NS	NS	NS	> 140	> 200
Reactive Cyanide	mg/kg	NS	NS	NS	< 250	< 2.0
Reactive Sulfide	mg/kg	NS	NS	NS	< 500	< 2.0

QC by SAR 10/20/2023

Notes:

1. Only compounds that were detected are provided in this table. For a complete list of analytes, refer to the laboratory report.
2. Analytical results are compared to applicable criteria from the Massachusetts Contingency Plan (MCP) Reportable Concentrations for S-1 Soils (RCS-1), last revised 2024.

Abbreviations:

mg/kg	milligrams per kilogram
NS	No Standard
WL	Results obtained from a deionized water leach of the sample
<	Not detected above the laboratory method reporting limit
BOLD	Parameter detected above laboratory detection limit

Table 2
Summary of Soil Analytical Results
Abington Department of Public Works
225 Central Street
Abington, Massachusetts

Parameter	Units	Reportable Concentrations (RCs)	Sample Identification									
			U-1	**U-2**	**U-3**	**U-4**	**MT-1**	**MT-2**	**MT-3**	**MT-4**	**MT-5**	**MT-6**
		RCS-1	**5-10'**	**0-5'**	**5-10'**	**0-5'**	**0-5'**	**0-5'**	**0-5'**	**0-5'**	**0-5'**	**0-5'**
			6/21/2023	**6/21/2023**	**6/21/2023**	**6/21/2023**	**6/21/2023**	**6/21/2023**	**6/21/2023**	**6/21/2023**	**6/21/2023**	**6/21/2023**
Total Petroleum Hydrocarbons (TPH)												
TPH (C9-C36)	mg/kg	1,000	< 11.8	--	< 12.3	--	--	--	--	--	--	--
Extractable Petroleum Hydorcarbons (EPH)												
C9-C18 Aliphatics	mg/kg	1,000	< 17.4	< 20.5	< 17.6	< 19.7	**43.1**	< 17.3	< 17.3	< 16.5	< 16.8	< 16.7
C19-C36 Aliphatics	mg/kg	3,000	< 17.4	< 20.5	< 17.6	< 19.7	**318**	< 17.3	< 17.3	< 16.5	< 16.8	< 16.7
C11-C22 Aromatics	mg/kg	1,000	< 17.4	< 20.5	< 17.6	< 19.7	**130**	**29.6**	< 17.3	< 16.5	**22.9**	< 16.7
Target Polycyclic Aromatic Hydrocarbons (PAHs)												
Phenanthrene	mg/kg	10	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**2.49**	< 0.46	< 0.44	**0.55**	< 0.45
Anthracene	mg/kg	1,000	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**0.64**	< 0.46	< 0.44	< 0.45	< 0.45
Benzo(a)anthracene	mg/kg	7	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**1.05**	< 0.46	< 0.44	< 0.45	< 0.45
Benzo(a)pyrene	mg/kg	2	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**0.93**	< 0.46	< 0.44	< 0.45	< 0.45
Benzo(b)fluoranthene	mg/kg	7	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**0.83**	< 0.46	< 0.44	< 0.45	< 0.45
Benzo(g,h,i)perylene	mg/kg	1,000	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**0.51**	< 0.46	< 0.44	< 0.45	< 0.45
Benzo(k)fluoranthene	mg/kg	70	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**0.72**	< 0.46	< 0.44	< 0.45	< 0.45
Chrysene	mg/kg	70	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**1.10**	< 0.46	< 0.44	**0.53**	< 0.45
Fluoranthene	mg/kg	1,000	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**2.80**	< 0.46	< 0.44	**0.72**	< 0.45
Fluorene	mg/kg	1,000	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	< 0.46	< 0.46	< 0.44	< 0.45	< 0.45
Indeno(1,2,3-cd)Pyrene	mg/kg	7	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**0.56**	< 0.46	< 0.44	< 0.45	< 0.45
Pyrene	mg/kg	1,000	< 0.47	< 0.55	< 0.47	< 0.52	< 0.47	**2.30**	< 0.46	< 0.44	**0.87**	< 0.45
Volatile Petroleum Hydrocarbons (VPH)												
C5-C8 Aliphatics	mg/kg	100	< 13.5	< 18.5	< 12.2	< 15.8	< 13.7	< 14.6	< 14.3	< 12.1	< 12.5	< 13.0
C9-C12 Aliphatics	mg/kg	1,000	< 26.9	< 36.8	< 24.3	< 31.5	< 27.2	< 29.0	< 28.4	< 24.1	< 24.9	< 25.9
C9-C10 Aromatics	mg/kg	100	< 12.9	< 17.7	< 11.7	< 15.2	< 13.1	< 13.9	< 13.7	< 11.6	< 12.0	< 12.5
Target Volatile Organic Compounds (VOCs)												
Total VOCs	mg/kg	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Metals												
Lead	mg/kg	200	**9.94**	**91.0**	< 4.07	**6.87**	--	--	--	--	--	--

QC by SAR 10/20/2023

Notes:
1. Only compounds that were detected are provided in this table. For a complete list of analytes, refer to the laboratory report.
2. Analytical results are compared to applicable criteria from the Massachusetts Contingency Plan (MCP) Reportable Concentrations for S-1 Soils (RCS-1), last revised 2024.

Abreviations:

MCP	Massachusetts Contingency Plan, 310 CMR 40.0000
<	Not detected above the laboratory method reporting limit
NS	No Standard
--	Not Tested
BOLD	Parameter detected above laboratory detection limit

Table 3
Summary of Groundwater Analytical Results
Abington Department of Public Works
225 Central Street
Abington, Massachusetts

Parameter	**Units**	**Reportable Concentrations (RCs)**	**EPA Dewatering & Remediation General Permit Discharge (DRGP) Parameters**	**Sample Identification**		
		RCGW-1[1]		**MW-1**	**MW-2**	**MW-3**
				6/30/2023	**6/30/2023**	**6/30/2023**
Total Petroleum Hydrocarbons (TPH)						
Total Petroleum Hydrocarbons (C9-C36)	ug/l	200	5,000	**170**	< 93.5	< 4,700
Extractable Petroleum Hyodrocarbons (EPH)						
C9-C18 Aliphatics	ug/l	700	NS	< 93	< 93	< 93
C19-C36 Aliphatics	ug/l	14,000	NS	< 93	< 93	< 93
C11-C22 Aromatic	ug/l	200	NS	< 93.5	< 93.5	< 93.5
Target Polycyclic Aromatic Hydrocarbons (PAHs)						
Total PAHs	ug/l	NS	NS	--	--	ND
Volatile Petroleum Hyodrocarbons (VPH)						
C5-C8 Aliphatics	ug/l	300	NS	< 158	< 158	< 158
C9-C10 Aromatics	ug/l	200	NS	< 100	< 100	< 100
C9-C12 Aliphatics	ug/l	700	NS	< 270	< 270	< 270
Volatile Organic Compounds (VOCs)						
Naphthalene	ug/l	140	20.0	--	--	**0.5**
Semi-Volatile Organic Compounds (SVOCs)						
Total SVOCs	ug/l	NS	NS	--	--	ND
Polychlorinated Biphenyls (PCBs)						
Total PCBs	ug/l	0.5	0.5	--	--	ND
Dissolved Metals						
Iron	ug/l	NS	5,000	--	--	**261**
Zinc	ug/l	900	420	--	--	**6.0**
Total Metals[3]						
Iron	ug/l	NS	5,000	--	--	**526**
Zinc	ug/l	NS	420	--	--	**5.8**
General Chemistry						
Total Hardness	ug/l	NS	NS	--	--	**58,600**
Chloride	mg/l	NS	230,000	--	--	**672**
Total Suspended Solids	mg/l	NS	30	--	--	**49**

QC by SAR 10/24/2023

Notes:

1. Only compounds that were detected are provided in this table. For a complete list of analytes, refer to the laboratory report.
2. Analytical results are compared to applicable criteria from the Massachusetts Contingency Plan (MCP) Reportable Concentrations RCGW-1, last revised 2024.
3. Reportable Concentrations are only available for dissolved metals, not total metals.

Abbreviations:

DRGP	Dewatering & Remediation General Permit
<	Not detected above laboratory method reporting limit
--	Not Tested
ug/l	micrograms per liter
mg/L	miligrams per liter
NS	No Standard
BOLD	Parameter detected above laboratory detection limit
BOLD ▨	Parameter detected above RGP parameters

Appendix A – LGCI's Test Pit Logs

LGCI
Lahlaf Geotechnical Consulting, Inc.

100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

BORING LOG

B-1
PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/23/23
DATE COMPLETED: 1/23/23
BORING LOCATION: Near NE corner of prop. fire station
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1)
TOTAL DEPTH: 22 ft.
WEATHER: 30's / Rain
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 5.0 ft. / El. 86.0 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb.
HAMMER DROP: 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP
CHECKED BY: TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.5 90.5	Top 6": Asphalt
	90.0	0.5–2	S1	4-6-8 (14)	18/10		Fill		S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, trace of asphalt, brown, moist
		2–4	S2	4-6-3-3 (9)	24/17				S2 - Similar to S1
5		4–6	S3	2-2-9-9 (11)	24/16			▽ ▼	S3 - Silty SAND (SM), fine to medium, 15-20% fines, trace of organic soil, dark brown, wet
	85.0	6–8	S4	9-12-12-11 (24)	24/15		Sand	6.0 85.0	S4 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, gray, wet
10	80.0	10–12	S5	6-6-10-14 (16)	24/12				S5 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 25-30% fine to coarse subrounded gravel, brown, wet
15	75.0	15–17	S6	13-17-21-30 (38)	24/18				S6 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 20-25% fine to coarse subangular gravel, trace of weathered rock, light brown to purple, wet
20	70.0	20–22	S7	13-15-14-14 (29)	24/14			22.0	S7 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, ~10% fines, 20-25% fine to coarse subangular gravel, gray to purple, wet
25									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

BORING LOG

B-2

PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/24/23 **DATE COMPLETED:** 1/24/23
BORING LOCATION: Near SE corner of prop. fire station
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
∇ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 5.0 ft. / El. 86.0 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0					Topsoil	0.5 90.5	S1 - Top 6": Topsoil
	90.0	0-2	S1	2-11-10-6 (21)	24/20		Fill		Bot. 14": Silty SAND (SM), fine, 15-20% fines, trace of organic soil, trace of asphalt, dark brown, moist
		2-4	S2	7-5-3-3 (8)	24/16		Fill		S2 - Silty SAND (SM), 15-20% fines, trace of organic soil, gray, moist
5	85.0	4-6	S3	3-5-10-10 (15)	24/18		Fill	∇ ▼ 6.0 85.0	S3 - Similar to S2, wet
		6-8	S4	9-9-9-12 (18)	24/16		Sand		S4 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, gray, wet
10	80.0	10-12	S5	6-10-10-10 (20)	24/17		Sand		S5 - Silty SAND (SM), fine to medium, ~20% fines, light brown to gray, wet
15	75.0	15-17	S6	7-9-9-16 (18)	24/18		Sand		S6 - Silty SAND (SM), fine, 25-30% fines, light brown, wet
20	70.0	20-22	S7	11-20-35-21 (55)	24/19		Sand	22.0	S7 - Poorly Graded SAND (SP), fine to medium, trace coarse, 0-5% fines, light brown, wet
25									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings and two (2) bags of gravel.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

LGCI
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Fax: (978) 330-5056

BORING LOG

B-3

PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/24/23 **DATE COMPLETED:** 1/24/23
BORING LOCATION: Near northern edge of prop. fire station
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Cloudy
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 5.5 ft. / El. 85.5 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.4 90.6	Top 5": Asphalt
	90.0	0.5–2	S1	13-10-10 (20)	18/4		Fill		S1 - Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~20% coarse subangular gravel, trace of asphalt, brown, moist
		2–4	S2	5-2-2-2 (4)	24/12				S2 - Silty SAND (SM), fine to medium, 25-30% fines, trace of organic soil, trace of plastic, brown to black, moist
5	85.0	4–6	S3	2-2-10-12 (12)	24/11			▽ ▼ 6.0 85.0	S3 - Silty SAND (SM), fine to medium, 20-25% fines, trace of organic soil, dark brown, wet
		6–8	S4	20-15-15-16 (30)	24/18		Sand		S4 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, gray, wet
10	80.0	10–12	S5	4-4-4-7 (8)	24/15				S5 - Similar to S4, fine to medium, trace coarse, 5-10% fines
15	75.0	15–17	S6	24-29-18-21 (47)	24/17				S6 - Poorly Graded SAND with Silt (SP-SM), fine, 5-10% fines, brown, wet
20	70.0	20–22	S7	11-20-60-48 (80)	24/21			22.0	S7 - Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 30-35% fine to coarse angular gravel, trace of weathered rock, gray to purple, wet
									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings and three (3) bags of gravel. Restored ground surface with asphalt cold patch.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

Lahlaf Geotechnical Consulting, Inc.

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Telephone: (978) 330-5912
Fax: (978) 330-5056

BORING LOG

B-4

PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/24/23 **DATE COMPLETED:** 1/24/23
BORING LOCATION: Near southern portion of prop. fire station
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Cloudy
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 4.0 ft. / El. 87.0 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 90.7	Top 4": Asphalt
	90.0	0.5–2	S1	11-11-14 (25)	18/14		Fill		S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines. trace of organic soil, trace of asphalt, dark brown, moist
		2–4	S2	14-11-7-7 (18)	24/19				S2 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, trace of organic soil, gray, moist
5		4–6	S3	3-3-2-2 (5)	24/3		Swamp Deposits	4.0 ▼ 87.0	S3 - Silty SAND (SM), fine, 30-35% fines, trace of organic soil, trace of wood, black, wet
	85.0	6–8	S4	2-3-14-13 (17)	24/14				S4 - Similar to S3, slightly plastic fines
		8–10	S5	12-12-12-11 (24)	24/2				S5 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, trace of organic soil, dark brown, wet
10	80.0	10–12	S6	12-12-11-11 (23)	24/20		Sand	10.0 81.0	S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, brown, wet
15	75.0	15–17	S7	13-20-13-17 (33)	24/13				S7 - Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 10-15% fines, 10-15% fine to coarse subangular gravel, brown, wet
20	70.0	20–22	S8	14-18-14-13 (32)	24/12			22.0	S8 - Silty SAND with Gravel (SM), fine to coarse, ~20% fines, 20-25% fine to coarse angular gravel, trace of weathered rock, light brown, wet (piece of metal possible drill casing)
25									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings and six (6) bags of gravel. Restored ground surface with asphalt cold patch.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/24/23
DATE COMPLETED: 1/24/23
BORING LOCATION: Near NW corner of prop. fire station
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1)
TOTAL DEPTH: 22 ft.
WEATHER: 30's / Cloudy
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 4.0 ft. / El. 87.0 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb.
HAMMER DROP: 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP
CHECKED BY: TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0					Topsoil	0.5 90.5	S1 - Top 6": Topsoil
	90.0	0–2	S1	1-1-2-4 (3)	24/24		Fill		Bot. 18": Silty SAND (SM), fine to medium, 15-20% fines, trace of organic soil, brown, moist
		2–4	S2	4-2-3-3 (5)	24/17		Fill	4.0 ▼ 87.0	S2 - Similar to S1 Bot. 18"
5	85.0	4–6	S3	2-2-10-13 (12)	24/12		Swamp Deposits	6.0 85.0	S3 - Silty SAND (SM), fine, 30-35% fines, trace of organic soil, trace of wood, black, wet
		6–8	S4	13-14-17-18 (31)	24/18		Sand		S4 - Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 5-10% fines, gray, wet
		8					Sand		
10	80.0	10–12	S5	6-7-7-7 (14)	24/6		Sand		S5 - Silty SAND (SM), fine, 25-30% fines, light brown, wet
		12					Sand		
15	75.0	15–17	S6	7-7-5-4 (12)	24/10		Sand		S6 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, light brown, wet
		17					Sand		
20	70.0	20–22	S7	12-12-29-11 (41)	24/24		Sand	22.0	S7 - Similar to S6, 5-10% fines
25		22							Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings and three (3) bags of gravel.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/24/23 **DATE COMPLETED:** 1/24/23
BORING LOCATION: Near SW corner of prop. fire station
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 4.5 ft. / El. 86.5 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 90.7	Top 4": Asphalt
	90.0	0.5–2	S1	7-7-8 (15)	18/13		Fill		S1 - Silty SAND with Gravel (SM), fine to coarse, ~20% fines, ~15% fine to coarse subangular gravel, trace of asphalt, dark brown, moist
		2–4	S2	12-8-8-7 (16)	24/20				S2 - Similar to S1, ~20% fine to coarse subangular gravel
5	85.0	4–6	S3	3-5-6-3 (11)	24/4		Sand	4.0 ▽ 87.0 ▼	S3 - Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, subangular, 5-10% fines, 15-20% fine to coarse sand, light brown, wet
		6–8	S4	3-2-1-1 (3)	24/12				S4 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, petroleum odor, gray, wet
10	80.0	10–12	S5	11-9-6-6 (15)	24/19				S5 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, 10-15% fine to coarse subrounded gravel, brown, wet
15	75.0	15–17	S6	7-8-8-11 (16)	24/14				S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, 0-5% fine subrounded gravel, light brown, wet
20	70.0	20–22	S7	16-51-55-57 (106)	24/20			22.0	S7 - Similar to S6
25									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings and three (3) bags of gravel. Restored ground surface with asphalt cold patch.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/23/23 **DATE COMPLETED:** 1/23/23
BORING LOCATION: Near center of prop. maintenance facility
COORDINATES: NA
SURFACE El.: 95 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Rain
GROUNDWATER LEVELS:
∇ **DURING DRILLING:** 4.0 ft. / El. 91.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 5.0 ft. / El. 90.0 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 94.7	Top 4": Asphalt
		0.5–2	S1	8-6-5 (11)	18/11		Fill		S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, trace of asphalt, brown, moist
		2–4	S2	4-2-3-6 (5)	24/17				S2 - Similar to S1
								4.0 ∇ 91.0	
5	90.0	4–6	S3	14-15-10-10 (25)	24/19		Sand	▼	S3 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, light brown, wet
		6–8	S4	4-4-4-4 (8)	24/14				S4 - Similar to S3
10	85.0	10–12	S5	1-1-1-2 (2)	24/9				S5 - Similar to S3
15	80.0	15–17	S6	4-4-5-4 (9)	24/10				S6 - Similar to S3
20	75.0	20–22	S7	4-5-5-5 (10)	24/13				S7 - Silty SAND (SM), fine, 25-30% fines, light brown, wet
								22.0	Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.
25	70.0								

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/23/23 **DATE COMPLETED:** 1/23/23
BORING LOCATION: Near southern addition for highway barn
COORDINATES: NA
SURFACE El.: 91 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Rain
GROUNDWATER LEVELS:
∇ **DURING DRILLING:** 4.0 ft. / El. 87.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 4.5 ft. / El. 86.5 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 90.7	Top 4": Asphalt
	90.0	0.5 2	S1	4-2-4 (6)	18/12		Fill	2.0 89.0	S1 - Silty SAND (SM), fine to medium, 15-20% fines, trace of asphalt, trace of organic soil, dark brown, moist
		2 4	S2	6-10-10-11 (20)	24/14		Sand		S2 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, gray, moist
5	85.0	4 6	S3	6-7-7-9 (14)	24/17			∇ ▼	S3 - Similar to S2, wet
		6 8	S4	16-13-13-13 (26)	24/20				S4 - Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 5-10% fines, 5-10% fine to coarse suabngular gravel, light brown, wet
10	80.0	10 12	S5	12-16-12-12 (28)	24/16				S5 - Similar to S4, 0-5% fine subrounded gravel
15	75.0	15 17	S6	17-19-28-18 (47)	24/19				S6 - Silty SAND with Gravel (SM), fine to medium, 20-25% fines, 15-20% fine to coarse subangular gravel, trace of weathered rock, gray to purple, wet
20	70.0	20 22	S7	19-26-30-35 (56)	24/13			22.0	S7 - Similar to S6, 20-25% fine to coarse subangular gravel
									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/23/23
DATE COMPLETED: 1/23/23
BORING LOCATION: Near SW corner of prop. salt shed
COORDINATES: NA
SURFACE El.: 96 ft. (see note 1)
TOTAL DEPTH: 22 ft.
WEATHER: 30's / Rain
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 6.0 ft. / El. 90.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 5.5 ft. / El. 90.5 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb.
HAMMER DROP: 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP
CHECKED BY: TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
	95.0	0 2	S1	6-14-13-8 (27)	24/17				S1 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of asphalt, dark brown, moist
		2 4	S2	7-5-4-5 (9)	24/19				S2 - Poorly Graded SAND with Silt (SP-SM), fine, trace medium, ~5% fines, gray, moist
5		4 6	S3	3-4-5-5 (9)	24/13		Fill	▼ ▽	S3 - Similar to S2, 10-15% coarse subrounded gravel
	90.0	6 8	S4	3-3-2-1 (5)	24/16				S4 - Silty SAND (SM), fine, 20-25% fines, gray, wet
10		8 10	S5	1-1-1-1 (2)	24/12			10.0 86.0	S5 - Similar to S4, trace of asphalt
	85.0	10 12	S6	7-8-8-7 (16)	24/20				S6 - Sandy SILT (ML), nonplastic, 30-35% fine sand, gray, wet
15		12							
	80.0	15 17	S7	13-13-9-9 (22)	24/18		Sand		S7 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, brown, wet
20		17							
	75.0	20 22	S8	10-10-16-18 (26)	24/0			22.0	S8 - No recovery
25									Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/23/23
DATE COMPLETED: 1/23/23
BORING LOCATION: North of prop. fire station
COORDINATES: NA
SURFACE El.: 93 ft. (see note 1)
TOTAL DEPTH: 12 ft.
WEATHER: 30's / Rain
GROUNDWATER LEVELS:
▽ **DURING DRILLING:** 4.0 ft. / El. 89.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 5.0 ft. / El. 88.0 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb.
HAMMER DROP: 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP
CHECKED BY: TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata		Depth El.(ft.)	Material Description
		0.5					Asphalt	■	0.5 92.5	Top 6": Asphalt
		0.5–2	S1	2-6-6 (12)	18/10		Fill	▨		S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, ~5% fines, ~5% coarse subrounded gravel, trace of asphalt, light brown, moist
	90.0	2–4	S2	4-2-3-5 (5)	24/21			▨	4.0 ▽ 89.0	S2 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, light brown, moist (appears reworked)
5		4–6	S3	4-6-7-6 (13)	24/19		Sand	░	▼	S3 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, wet
		6–8	S4	8-7-6-6 (13)	24/18			░		S4 - Similar to S3, 10-15% fines
	85.0	8–10	S5	4-4-4-5 (8)	24/15			░		S5 - Similar to S3, 10-15% fines
10		10–12	S6	5-4-4-4 (8)	24/19			░	12.0	S6 - Similar to S3, 10-15% fines
	80.0	12								Bottom of borehole at 12.0 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.
15										
	75.0									
20										
	70.0									
25										

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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BORING LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/23/23
DATE COMPLETED: 1/23/23
BORING LOCATION: South of prop. maintenance facility
COORDINATES: NA
SURFACE El.: 94 ft. (see note 1)
TOTAL DEPTH: 17 ft.
WEATHER: 30's / Rain
GROUNDWATER LEVELS:
∇ **DURING DRILLING:** 4.0 ft. / El. 90.0 ft. Based on sample moisture
▼ **AT END OF DRILLING:** 4.5 ft. / El. 89.5 ft.
▼ **OTHER:** -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb.
HAMMER DROP: 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP
CHECKED BY: TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt ■	0.5 93.5	Top 6": Asphalt
		0.5	S1	22-15-9 (24)	18/15		Fill ▨	2.0 92.0	S1 - Poorly Graded SAND with Silt (SP-SM), fine, 5-10% fines, trace of asphalt, light brown, moist
		2	S2	10-10-9-8 (19)	24/22		Sand		S2 - Poorly Graded SAND (SP), fine, 0-5% fines, light brown, moist
5	90.0	4	S3	6-3-3-3 (6)	24/18			∇ ▼	S3 - Poorly Graded SAND with Silt (SP-SM), fine, 5-10% fines, light brown, wet
		6	S4	3-3-3-3 (6)	24/15				S4 - Similar to S3
	85.0	8	S5	4-2-2-2 (4)	24/13				S5 - Similar to S3, 10-15% fines
10		10	S6	4-3-3-3 (6)	24/12				S6 - Similar to S3, 10-15% fines
	80.0	12							
15		15	S7	5-7-9-10 (16)	24/20			17.0	S7 - Silty SAND (SM), fine, 20-25% fines, light brown, wet
20 25	75.0 70.0	17							Bottom of borehole at 17.0 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

Appendix B – LGCI's Boring Logs

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TEST PIT LOG

TP-1-OW
PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23 **DATE COMPLETED:** 1/19/23
TEST PIT LOCATION: Near southern addition for highway barn
COORDINATES: NA
SURFACE EL.: 92 ft. (see note 1) **TOTAL DEPTH:** 8 ft.
GROUNDWATER LEVELS:
∇ **DURING EXCAVATION:** 6.5 ft. / El. 85.5 ft.
▼ **AT END OF EXCAVATION:** 6.5 ft. / El. 85.5 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 8.0' x 4.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Asphalt	0.4 91.6	0 ft. - 0.4 ft.: Asphalt
2.5 5.0	90.0 87.5	E		Fill	6.0 86.0	0.4 ft. - 6 ft.: Sandy SILT (ML), nonplastic, 40-45% mostly fine to medium sand, 0-5% fine gravel, trace of organic soil, light brown, moist
7.5	85.0	E	1 2	Sand	8.0	6 ft. - 8 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, petroleum odor, gray, ▼ moist to wet

REMARK 1: The environmental engineer installed a groundwater observation well in the test pit.
REMARK 2: Test pit terminated at depth of 8 feet due to sides of excavation collapsing.

Bottom of test pit at 8.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket. Environmental engineer installed groundwater observation well.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23
DATE COMPLETED: 1/19/23
TEST PIT LOCATION: Near northern entrance to prop. fire station
COORDINATES: NA
SURFACE EL.: 92 ft. (see note 1)
TOTAL DEPTH: 8 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** 4.5 ft. / El. 87.5 ft.
▼ **AT END OF EXCAVATION:** 4.5 ft. / El. 87.5 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 10.0' x 5.0'
LOGGED BY: TG
CHECKED BY: NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Topsoil	0.3 91.7	0 ft. - 0.3 ft.: Topsoil
2.5	90.0	E	1	Fill	4.0 88.0	0.3 ft. - 4 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, trace of organic soil, trace of wood, trace of brick, trace of asphalt, trace of plastic, trace of ceramics, brown, moist REMARK 1: Encountered abandoned drainage basing between depths of 2 feet and 4.5 feet.
5.0	87.5 85.0	E		Buried Organic Soil	7.0 85.0	4 ft. - 7 ft.: Silty SAND (SM), fine to medium, 25-30% fines, 10-15% fine to coarse subrounded gravel, ▼ trace of organic soil, trace of glass, trace of ceramics, trace of roots, black, wet
7.5		E	2	Sand	8.0	7 ft. - 8 ft.: Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, subrounded, ~10% fines, 20-25% fine to coarse sand, gray, wet REMARK 2: Test pit terminated at depth of 8 feet due to sides of excavation collapsing.

Bottom of test pit at 8.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23
DATE COMPLETED: 1/19/23
TEST PIT LOCATION: Near parking lot north of prop. fire station
COORDINATES: NA
SURFACE EL.: 93 ft. (see note 1)
TOTAL DEPTH: 11 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** Not encountered
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 10.0' x 4.0'
LOGGED BY: TG
CHECKED BY: NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Asphalt ■	0.3 92.7	0 ft. - 0.3 ft.: Asphalt
	92.5	E		Fill ▨	1.5 91.5	0.3 ft. - 1.5 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, 5-10% fine subrounded gravel, trace of asphalt, orange-brown, moist
2.5 5.0 7.5 10.0	90.0 87.5 85.0 82.5	E	1	Sand	11.0	1.5 ft. - 11 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, light brown, moist

REMARK 1: Test pit terminated at depth of 11 feet due to sides of excavation collapsing.

Bottom of test pit at 11.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23
DATE COMPLETED: 1/20/23
TEST PIT LOCATION: Near western side of prop. maintenance facility
COORDINATES: NA
SURFACE EL.: 94 ft. (see note 1)
TOTAL DEPTH: 9 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** Not encountered
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 10.0' x 5.0'
LOGGED BY: TG
CHECKED BY: MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	92.5	E		Fill ▨	1.5 92.5	0 ft. - 1.5 ft.: Silty SAND (SM), fine to coarse, 15-20% fines, ~10% fine subangular gravel, trace of asphalt, trace of organic soil, black, moist
2.5 5.0 7.5	90.0 87.5 85.0	E	1	Sand ▒	9.0 85.0	1.5 ft. - 9 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, light brown, moist

REMARK 1: Test pit terminated at depth of 9 feet due to sides of excavation collapsing.

Bottom of test pit at 9.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

TP-5
PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23
DATE COMPLETED: 1/19/23
TEST PIT LOCATION: Near parking lot south of prop. salt shed
COORDINATES: NA
SURFACE EL.: 95 ft. (see note 1)
TOTAL DEPTH: 9 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** 8.5 ft. / El. 86.5 ft.
▼ **AT END OF EXCAVATION:** 8.5 ft. / El. 86.5 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 11.0' x 5.0'
LOGGED BY: TG
CHECKED BY: NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
2.5	92.5	E		Fill ▨		0 ft. - 3.5 ft.: Silty SAND (SM), fine to medium, trace coarse, 15-20% fines, 5-10% fine subrounded gravel, trace of asphalt, trace of brick, trace of organic soil, trace of roots, black, moist
					3.5 91.5	
5.0	90.0	E		Sand ░		3.5 ft. - 9 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, petroluem odor, gray, moist to wet
7.5	87.5				▼	
			1		9.0	REMARK 1: Test pit terminated at depth of 9 feet due to sides of excavation collapsing. Bottom of test pit at 9.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23
DATE COMPLETED: 1/19/23
TEST PIT LOCATION: Near NE corner of prop. salt shed
COORDINATES: NA
SURFACE EL.: 113 ft. (see note 1)
TOTAL DEPTH: 15 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** Not encountered
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 15.0' x 5.0'
LOGGED BY: TG
CHECKED BY: NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Fill		0 ft. - 15 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 15-20% fine subrounded gravel, trace of organic soil, trace of brick, trace of concrete, trace of plastic, trace of metal, trace of ash, dark brown, moist
		M	1			REMARK 1: Pieces of abandoned foundation encountered between depths of 2 feet and 6 feet.
	110.0					
5						
	105.0	E				
10						
	100.0					
15			2		15.0	REMARK 2: Test pit terminated at depth of 15 feet due to reaching excavating capacity of excavator. Bottom of test pit at 15.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23 **DATE COMPLETED:** 1/19/23
TEST PIT LOCATION: Near NW corner of prop. salt shed
COORDINATES: NA
SURFACE EL.: 111 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** Not encountered
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 9.0' x 4.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata		Depth El.(ft.)	Material Description
	110.0	E		Topsoil	▒	2.0	0 ft. - 2 ft.: Topsoil
2.5 5.0 7.5	107.5 105.0 102.5	E		Fill	▨	109.0 9.0	2 ft. - 9 ft.: Silty SAND (SM), fine to medium, trace coarse, ~20% fines, 5-10% fine to coarse subrounded gravel, 5-10% boulders up to 2 feet in diameter, trace of organic soil, trace of roots, trace of brick, trace of concrete, trace of rebar, trace of asphalt, trace of plastic, brown, moist
10.0	100.0	E		Sand	░	102.0 12.0	9 ft. - 12 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, gray, moist
							Bottom of test pit at 12.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23
DATE COMPLETED: 1/20/23
TEST PIT LOCATION: Near prop. fuel station
COORDINATES: NA
SURFACE EL.: 94 ft. (see note 1)
TOTAL DEPTH: 11 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** Not encountered
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 10.0' x 5.0'
LOGGED BY: TG
CHECKED BY: MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata		Depth El.(ft.)	Material Description
	92.5	E		Fill	▨		0 ft. - 2 ft.: Silty SAND (SM), fine to coarse, 15-20% fines, 5-10% fine subangular gravel, trace of organic soil, trace of asphalt, trace of roots, black, moist
2.5 5.0 7.5 10.0	90.0 87.5 85.0	E		Sand	∴	2.0 92.0	2 ft. - 11 ft.: Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, light brown, moist
						11.0 83.0	Bottom of test pit at 11.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/19/23
DATE COMPLETED: 1/19/23
TEST PIT LOCATION: Near prop. helicopter pad
COORDINATES: NA
SURFACE EL.: 95 ft. (see note 1)
TOTAL DEPTH: 10 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** 8.5 ft. / El. 86.5 ft.
▼ **AT END OF EXCAVATION:** 8.5 ft. / El. 86.5 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 40's / Cloudy
TEST PIT DIMENSIONS: 10.0' x 5.0'
LOGGED BY: TG
CHECKED BY: NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
				▨		0 ft. - 4.5 ft.: Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, trace of asphalt, trace of brick, trace of rebar, trace of plastic, black, moist
2.5	92.5	E		Fill		
					4.5 90.5	4.5 ft. - 10 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, petroleum odor, gray, moist to wet
5.0	90.0					
7.5	87.5	E		Sand		
						▼
10.0	85.0		1		10.0	REMARK 1: Test pit terminated at depth of 10 feet due to sides of excavation collapsing.

Bottom of test pit at 10.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23
DATE COMPLETED: 1/20/23
TEST PIT LOCATION: Near NW corner of prop. maintenance facility
COORDINATES: NA
SURFACE EL.: 95 ft. (see note 1)
TOTAL DEPTH: 7.5 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** 6.0 ft. / El. 89.0 ft.
▼ **AT END OF EXCAVATION:** 6.0 ft. / El. 89.0 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 12.0' x 9.0'
LOGGED BY: TG
CHECKED BY: MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Fill ▨	1.0 94.0	0 ft. - 1 ft.: Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, trace of asphalt, trace of brick, trace of glass, brown to black, moist
2.5	92.5					1 ft. - 7.5 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, trace of coarse, 10-15% fines, light brown, moist to wet
		E		Sand		
5.0	90.0					
					▼	
7.5	87.5		1		7.5 87.5	REMARK 1: Test pit terminated at depth of 7.5 feet due to sides of excavation collapsing. Bottom of test pit at 7.5 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23
DATE COMPLETED: 1/20/23
TEST PIT LOCATION: Near SE corner of prop. maintenance facility
COORDINATES: NA
SURFACE EL.: 94 ft. (see note 1)
TOTAL DEPTH: 8.5 ft.
GROUNDWATER LEVELS:
∇ **DURING EXCAVATION:** 6.0 ft. / El. 88.0 ft.
▼ **AT END OF EXCAVATION:** 6.0 ft. / El. 88.0 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 8.0' x 6.0'
LOGGED BY: TG
CHECKED BY: MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata		Depth El.(ft.)	Material Description
2.5	92.5	E		Fill	▨	2.5 91.5	0 ft. - 2.5 ft.: Silty SAND (SM), fine to coarse, 15-20% fines, 5-10% fine subangular gravel, trace of organic soil, trace of asphalt, trace of roots, trace of glass, brown, moist
5.0 7.5	90.0 87.5	E	1	Sand	░	8.5 85.5	2.5 ft. - 8.5 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, light brown, moist ▼

REMARK 1: Test pit terminated at depth of 8.5 feet due to sides of excavation collapsing.

Bottom of test pit at 8.5 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23
DATE COMPLETED: 1/20/23
TEST PIT LOCATION: Near parking lot East of prop. fire station
COORDINATES: NA
SURFACE EL.: 91 ft. (see note 1)
TOTAL DEPTH: 7.5 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** 0.0 ft. / El. 91.0 ft.
▼ **AT END OF EXCAVATION:** 4.0 ft. / El. 87.0 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 8.0' x 4.0'
LOGGED BY: TG
CHECKED BY: MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.) ▽	Material Description
	90.0	E	1	Topsoil	1.0	0 ft. - 1 ft.: Topsoil REMARK 1: Puddle at ground surface
2.5 5.0	87.5 85.0	E	2	Buried Organic Soil	90.0 ▼ 6.0	1 ft. - 6 ft.: Silty SAND (SM), fine to medium, 30-35% fines, 0-5% fine to coarse subrounded gravel, trace of organic soil, trace of ash, trace of glass, trace of tile, trace of metal, black, wet REMARK 2: Drainage utility encountered on western side of excavation between depths of 3 feet and 5 feet.
7.5		E	3	Fill	85.0 7.5	6 ft. - 7.5 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, trace of organic soil, brown, wet REMARK 3: Test pit terminated at depth of 7.5 feet due to sides of excavation collapsing.

Bottom of test pit at 7.5 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

LGCI
Lahlaf Geotechnical Consulting, Inc.

100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-13

PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23
DATE COMPLETED: 1/20/23
TEST PIT LOCATION: Near SW corner of prop. maintenance facility
COORDINATES: NA
SURFACE EL.: 94 ft. (see note 1)
TOTAL DEPTH: 9 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** Not encountered
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 12.0' x 6.0'
LOGGED BY: TG
CHECKED BY: MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata		Depth El.(ft.)	Material Description
		E		Fill	▨		0 ft. - 1 ft.: Silty SAND (SM), fine to coarse, ~20% fines, 5-10% fine angular gravel, trace of organic soil, trace of roots, trace of asphalt, dark brown, moist
						1.0 93.0	1 ft. - 9 ft.: Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, light brown, moist
	92.5				⁘		
2.5					⁘		
	90.0				⁘		
5.0		E		Sand	⁘		
	87.5				⁘		
7.5					⁘		
	85.0		1		⁘	9.0 85.0	REMARK 1: Test pit terminated at depth of 9 feet due to sides of excavation collapsing.

Bottom of test pit at 9.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

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Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-14

PAGE 1 OF 1

CLIENT: Kaestle Boos Associates, Inc.
PROJECT NAME: Prop. Fire Station
LGCI PROJECT NUMBER: 2017
PROJECT LOCATION: Abington, MA

DATE STARTED: 1/20/23 **DATE COMPLETED:** 1/20/23
TEST PIT LOCATION: Near NE corner of prop. maintenance facility
COORDINATES: NA
SURFACE EL.: 97 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** 7.5 ft. / El. 89.5 ft.
▼ **AT END OF EXCAVATION:** 7.5 ft. / El. 89.5 ft.

EXCAVATION SUBCONTRACTOR: Town of Abington DPW
EXCAVATION FOREMAN: Dan Soper
EXCAVATOR TYPE/MODEL: CAT 420F
WEATHER: 30's / Rain
TEST PIT DIMENSIONS: 8.0' x 7.0'
LOGGED BY: TG **CHECKED BY:** MBH

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata		Depth El.(ft.)	Material Description
2.5	95.0	E		Fill	▨		0 ft. - 3 ft.: Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, trace of roots, trace of asphalt, brown, moist
5.0 7.5	92.5 90.0	E	1	Sand	░	3.0 94.0	3 ft. - 9 ft.: Silty SAND (SM), fine to medium, ~15% fines, light brown, moist to wet ▼
						9.0 88.0	REMARK 1: Test pit terminated at depth of 9 feet due to sides of excavation collapsing. Bottom of test pit at 9.0 feet. Test pit backfilled with excavated material in 1-foot to 2-foot lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C100 titled "Existing Condition Plan, Abington Department of Public Works Facility, 225 Central Street, Abington, MA," prepared by Weston & Sampson, dated February 24, 2023, and provided to LGCI by Kaestle Boos Associates, Inc. via e-mail on February 24, 2023

Weston & Sampson℠

PROJECT

Abington DPW
225 Central Street
Abington, MA

REPORT OF BORING No. U-1
SHEET 1 OF 1
Project No. ENG22-0465
CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV. DATUM
DATE START 6/21/23 DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	37/60	0-5	0.0	Tan to gray, fine to medium SAND, trace fine gravel, trace organics; wet at 3.5 feet		**ASPHALT** **FILL**
5		2	48/60	5-10	0.0	Gray, fine to medium SAND, trace fine gravel; dry		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS BLOWS/FT	GRANULAR SOILS DENSITY	COHESIVE SOILS BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. U-1

Weston & Sampson

PROJECT
Abington DPW
225 Central Street
Abington, MA

REPORT OF BORING No. U-2/MW-2
SHEET 1 OF 1
Project No. ENG22-0465
CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV.
DATUM
DATE START 6/21/23
DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing
Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	52/60	0-5	0.0	Top soil 0 - 3" (3" to 5 feet fill material) Tan to gray, fine to medium SAND, trace fine gravel, trace organics, wood, glass little Silt; wet		**TOP SOIL** **FILL**
5		2	55/60	5-10	0.0	Brown to gray, fine to coarse SAND, some silt, little fine gravel; wet		**GRAVELY SAND**
10						End of boring at 12 feet. Well set at 12 feet		
15								

GRANULAR SOILS		COHESIVE SOILS
BLOWS/FT	DENSITY	BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. U-2/MW-2

Weston & Sampson℠

PROJECT	REPORT OF BORING No.	U-3
Abington DPW 225 Central Street Abington, MA	SHEET 1 OF 1	
	Project No.	ENG22-0465
	CHKD BY	Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV.
DATUM
DATE START 6/21/23
DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	PEN/REC (in)	DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	48/60	0-5	0.0	Asphalt 0 - 4" (4" to 5 feet fill material) Tan to gray, fine to coarse SAND, trace fine gravel, little silt, cinder, glass wood; wet at 4 feet		**ASPHALT** **FILL**
5		2	55/60	5-10	0.0	Light to dark brown, fine to coarse SAND, trace fine gravel; wet		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS		COHESIVE SOILS
BLOWS/FT	DENSITY	BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. U-3

Weston & Sampson

PROJECT	REPORT OF BORING No.	U-4
Abington DPW 225 Central Street Abington, MA	SHEET 1 OF 1	
	Project No.	ENG22-0465
	CHKD BY	Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh

BORING LOCATION
GROUND SURFACE ELEV. DATUM
DATE START 6/21/23 DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon

CASING:

CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	48/60	0-5	0.0	Asphalt 0 - 4" (4" to 5 feet fill material) Tan to gray, fine to coarse SAND, trace fine gravel, little silt, cinder, glass wood; wet at 4 feet		**ASPHALT** **FILL**
5		2	60/60	5-10	0.0	Brown to gray, fine to coarse SAND, some silt, trace fine gravel; wet		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS BLOWS/FT	GRANULAR SOILS DENSITY	COHESIVE SOILS BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. U-4

Weston & Sampson℠	PROJECT Abington DPW 225 Central Street Abington, MA	REPORT OF BORING No.	MT-1
		SHEET	1 OF 1
		Project No.	ENG22-0465
		CHKD BY	Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV. DATUM
DATE START 6/21/23 DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	48/60	0-5	0.0	Asphalt 0 - 4" (4" to 5 feet fill material) Brown to gray, fine to coarse SAND, trace fine gravel, little silt, cinder, glass wood and organics at 5 feet; wet		**ASPHALT** **FILL**
5		2	48/60	5-10	0.0	Brown to gray, fine to coarse SAND, some silt, trace fine gravel, little organics; wet.		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS BLOWS/FT	GRANULAR SOILS DENSITY	COHESIVE SOILS BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. MT-1

Weston & Sampson

Weston & Sampson	PROJECT Abington DPW 225 Central Street Abington, MA	REPORT OF BORING No. MT-2 SHEET 1 OF 1 Project No. ENG22-0465 CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV.
DATUM
DATE START 6/21/23
DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing
Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	42/60	0-5	0.0	Asphalt 0 - 6" (6" to 5 feet fill material) Brown to gray, fine to coarse SAND, trace fine gravel, little silt; wet		**ASPHALT** **FILL**
5		2	60/60	5-10	0.0	Brown to gray, fine to coarse SAND, some silt, trace fine gravel; wet.		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS BLOWS/FT	GRANULAR SOILS DENSITY	COHESIVE SOILS BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. MT-2

Weston & Sampson℠

PROJECT
Abington DPW
225 Central Street
Abington, MA

REPORT OF BORING No. MT-3
SHEET 1 OF 1
Project No. ENG22-0465
CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh

BORING LOCATION
GROUND SURFACE ELEV. DATUM
DATE START 6/21/23 DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	48/60	0-5	0.0	Asphalt 0 - 14" (14" to 5 feet fill material) Gray, fine to coarse SAND, trace fine gravel, little silt; wet		**ASPHALT**
								FILL
5		2	48/60	5-10	0.0	Brown to gray, fine to coarse SAND, some silt, trace fine gravel, wet		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS BLOWS/FT	GRANULAR SOILS DENSITY	COHESIVE SOILS BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. MT-3

Weston & Sampson	PROJECT Abington DPW 225 Central Street Abington, MA	REPORT OF BORING No. MT-4 SHEET 1 OF 1 Project No. ENG22-0465 CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV.
DATUM
DATE START 6/21/23
DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	PEN/REC (in)	DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	48/60	0-5	0.0	Asphalt 0 - 16" (16" to 5 feet fill material) Gray to brown, fine to coarse SAND, trace fine gravel, trace silt; wet		**ASPHALT** **FILL**
5		2	48/60	5-10	0.0	Light brown, fine to medium SAND, some Silt; wet		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS		COHESIVE SOILS
BLOWS/FT	DENSITY	BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. MT-4

Weston & Sampson℠	PROJECT Abington DPW 225 Central Street Abington, MA	REPORT OF BORING No. MT-5/MW-3 SHEET 1 OF 1 Project No. ENG22-0465 CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh
BORING LOCATION
GROUND SURFACE ELEV. DATUM
DATE START 6/21/23 DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon
CASING:
CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	PEN/REC (in)	DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	55/60	0-5	0.0	(Fill material) Gray to brown, fine to coarse SAND, trace fine gravel; wet		**FILL**
5		2	60/60	5-10	0.0	Light brown, fine to medium SAND, some silt; wet		**GRAVELY SAND**
10						End of boring at 12 feet. Well set at 12 feet		
15								

GRANULAR SOILS		COHESIVE SOILS
BLOWS/FT	DENSITY	BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:

1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.

2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. MT-5/MW-3

Weston & Sampson℠	PROJECT Abington DPW 225 Central Street Abington, MA	REPORT OF BORING No. MT-6 SHEET 1 OF 1 Project No. ENG22-0465 CHKD BY Sarah Ruizzo

BORING Co. New England Geotech
FOREMAN Hayes
WSE REP Padraic T. Kavanagh

BORING LOCATION
GROUND SURFACE ELEV. DATUM
DATE START 6/21/23 DATE END 6/21/23

SAMPLER: Truck-mounted Direct Push Geoprobe with 5-foot Spoon

CASING:

CASING SIZE: 4" Well Casing Method Direct Push

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (feet)	CASING (lb/ft)	SAMPLE No.	SAMPLE PEN/REC (in)	SAMPLE DEPTH (ft)	PID (ppm)	SAMPLE DESCRIPTION Burmister Classification	NOTES	STRATUM DESCRIPTION
0		1	60/60	0-5	0.0	(Fill material) Light brown, fine to medium SAND, trace fine gravel, some silt; wet		**FILL**
5		2	60/60	5-10	0.0	Light brown, fine to medium SAND, some silt, trace fine gravel; wet		**GRAVELY SAND**
10						End of boring at 10 feet		
15								

GRANULAR SOILS BLOWS/FT	GRANULAR SOILS DENSITY	COHESIVE SOILS BLOWS/FT
0-4	V. LOOSE	0-2
4-10	LOOSE	2-4
10-30	M. DENSE	4-8
30-50	DENSE	8-15
> 50	V. DENSE	15-30
		> 30

NOTES:

NOTES:
1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THIS BORING LOG. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS ARE MADE.

BORING No. MT-6

SECTION 00 31 43 - PERMITS

PART 1 – GENERAL

1.1 DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

1.2 RELATED WORK:

A. Section 31 00 00, EARTHWORK

B. Section 31 23 19, DEWATERING

1.3 GENERAL REQUIREMENTS:

A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00 72 00, GENERAL CONDITIONS.

Permits by Owner	Status
BWP AQ 06 Notification Prior to Construction or Demolition	*
Building Permit	*
Trench Permit (520 CMR 14.00)(eff. date 3/1/09)	*
NPDES Construction General Permit	*
Site Plan Approval for Phase I (Planning Board)	**
RDA Determination (Conservation Commission)	**

*Contractor shall prepare permit application and obtain the permit after contract is awarded, bearing all expenses. Owner will pay waive the permit application fee.

** Are available upon Request

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.1 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

A. The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.

B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Engineer, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

SECTION 00 41 13

FORM FOR GENERAL BID

To the Awarding Authority:

A. The Undersigned proposes to furnish all labor and materials required for ***Phase I – Salt Shed, Fuel Island, and Associated Site Work*** in Abington, Massachusetts, in accordance with the accompanying plans and specifications prepared by Weston & Sampson Engineers, Inc. & Kaestle Boos Associates, Inc for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda numbered ______________________________.

C. The proposed contract price, Base Bid (**Total of Item 1, Item 2, and Item 3**):

____ dollars
(in words)

($_______________________________________).
(in numbers)

D. The subdivision of the proposed contract price is as follows:

Item 1. The work of the general contractor, being all work other than that covered by Item 2 and Item 3:

$ ____________________________ (Base Bid)

Item 2. Sub-bids as follows:

Sub Trade	Name of Sub-Bidder	Bid Item	Amount	Bond Required "Y" or "N"
2A. **Waterproofing, Dampproofing and Caulking** Specification Section 07 00 01		Base Bid		
2B. **Electrical** Specification Section 26 00 01		Base Bid		

Total of Item 2 **$__________________** **Base Bid**

Item 3. The Base Bid work of the General Contractor for Unit Cost Item as follows: (Item 3 base bid pricing includes Item 3(a) and Item 3(b) combined. For additional information refer to ***01 22 00 MEASUREMENT AND PAYMENT*** and ***02 61 00.16 HANDLING, TRANSPORTATION, REUSE AND OFF-SITE DISPOSAL OF EXCAVATED MATERIAL***

Item No.	Estimated Quantity	Brief Description Unit Price Bid in Both Words and Figures	Unit Cost	Total in Figures
3(b)	1,000 tons	Handling, Transportation, and Disposal of Group B Material	$_________/ton	$ _________

The undersigned agrees that each of the above-named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made.

The undersigned agrees that if it is selected as general contractor, it will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

E. The undersigned agrees that, if it is selected as general contractor, it will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price.

The undersigned hereby certifies that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that it will comply fully with all laws and regulations applicable to awards made subject to section forty-four A.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. The word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity which sells materials, equipment or supplies used in or for, or engages in the performance of, the same or similar construction, reconstruction, installation, demolition, maintenance or repair work or any part thereof.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, Section 25C (10) of Chapter 152 (workers' compensation) or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulations promulgated thereunder

The Bidder hereby agrees that if selected as the Contractor it will commence work under this contract on or before a date to be fixed in the written "Notice to Proceed" given by the Owner to the Contractor and to substantially complete the project within ***200*** consecutive days of the start date fixed in the "Notice to Proceed". The Bidder further agrees to pay as liquidated damages the sum of the ***$500*** for each consecutive calendar day thereafter during which the work has not been substantially completed and fully completed, as provided in the "Liquidated Damages" provisions of Section 00 73 00 SUPPLEMENTARY CONDITIONS.

The undersigned understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 149, Sections 44A to 44J, as amended. Every bidder (including sub-bidders) must furnish the DCAM Update Statement with the bid.

The contract will be awarded to the lowest responsible and eligible bidder. The low Bidder will be determined on the basis of the sum of the base bid and the accepted alternates.

The undersigned understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The undersigned agrees that this bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids, where Federal approval is not required; and where Federal approval is required, the time for holding bids is 30 days, Saturdays, Sundays and legal holidays excluded, after Federal approval.

Bid security in the form of a bid bond, cash, certified check, treasurer's or cashier's check, payable to the Owner, in a dollar amount of 5 percent of the total bid, in accordance with the conditions in the INSTRUCTION TO BIDDERS, has been attached to this bid.

Pursuant to M.G.L. CH. 62C, Sec 49A, I certify under the penalties of perjury that I have complied with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

The undersigned certifies under penalties of perjury that there have been no substantial changes in its financial position or business organization other than those changes noted within the application since the applicant's most recent pre-qualification statement.

Respectfully submitted:

Date __________ By ______________________________

(Signature)

____

(Name - Typed or Printed)

____

(Title)

(SEAL - if bid is by a corporation)

____

(Business Name)

____

(Federal ID Number)

____

(Business Address)

____

(City and State)

____

(Telephone Number)

____

(Fax Number)

\\wse03.local\WSE\Projects\MA\Abington\ENG22-0465 DPW & Fire Station Design & Construction (With KBA)\Specifications\Phase I Salt Shed and Fuel Island Specifications\Div-00 Procurement and Contracting Requirements\00 43 13 - FORM FOR GENERAL BID.docx

SECTION 00 41 13.13 - FORM FOR SUB-BID ITEM 2-A

Waterproofing, Damp-proofing, & Caulking
(Specification Section 07 00 01)

To All General Bidders Except Those Excluded:

A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in Section No. 07 00 01 of the specifications and in any plans specified in such section, prepared by Weston & Sampson Engineers, Inc. for construction of ***Phase I – Salt Shed, Fuel Island, and Associated Site Work,*** in ***Abington, Massachusetts***, for the contract sum of

____ Dollars*

($_______________________________________).

*** All entries must be made clearly and in ink.**

B. This sub-bid includes addenda numbered ____________________.

C. This sub-bid

(___) may be used by any general bidder except:

____

____

____

____

(__) may only be used by the following general bidders:

____

____

____

____

(To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.)

D. The undersigned agrees that, if it is selected as a sub-bidder it will, within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested so to do in the general bid by the general bidder, who shall pay the premiums therefor, or if prequalification is required pursuant to section 44D 3/4, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the specifications for this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on its own payroll and in the absence of a contrary provision in the specifications, the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

Name	Class of Work	Bid Price

(Do not give bid price for any class or part thereof furnished by undersigned.)

F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

G. The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore described plans, specifications, including all general and supplemental general conditions stated therein, and addenda, and to assume toward it all the obligations and responsibilities that it, by those documents, assumes toward the Owner.

H. The undersigned offers the following information as evidence of its qualifications to perform the work as bid upon according to all the requirements of the plans and specifications:

1. Have been in business under present business name __________ years.

2. Ever failed to complete any work awarded? __________

3. List one or more recent buildings with names of General Contractor and architect on which you served as a subcontractor for work of similar character as required for the above-named building.

	Building	Architect	General Contractor	Amount of Contract
a.				
b.				
c.				

4. Bank reference ____

I. The undersigned hereby certifies it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee: and that it will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44 F.

J. The undersigned understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 149, Sections 44A to 44J, as amended. Every sub-bidder must furnish the DCAM Sub-bidder Update Statement with the bid.

K. The undersigned agrees to comply with the applicable portions of Division 00 and 01 of the project specifications, and other sections of the specification as referenced. The undersigned also agrees to coordinate all work with that of other trades to avoid conflict of equipment, so that the work of the entire project, including all trades, shall not be delayed or interfered with.

L. Bid security in the form of a bid bond, cash, certified check, treasurer's or cashier's check, payable to the Owner, in a dollar amount of 5 percent of the total bid, in accordance with the conditions in the INSTRUCTIONS TO BIDDERS, has been attached to this bid.

M. The successful sub-bidder shall be required to submit to the General Contractor a signed certification showing compliance with the minority manpower ratios and specific action steps contained in The Commonwealth of Massachusetts Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program reprinted in Section 00830 of this specification.

N. The undersigned further certifies under the penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date:____________________________________

____
(Name of Sub-bidder)

By: ____________________________________
(Title and Name of Person Signing Bid)

(SEAL - if bid is by
a corporation)

____

(Business Address)

____
(City and State)

____
(Telephone Number)

____
(Fax Number)

SECTION 00 41 13.13 - FORM FOR SUB-BID ITEM 2-B

Electrical
(Specification Section 26 00 01)

To All General Bidders Except Those Excluded:

A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in Section No. 26 00 01 of the specifications and in any plans specified in such section, prepared by Weston & Sampson Engineers, Inc. for construction ***Phase I – Salt Shed, Fuel Island, and Associated Site Work,*** in ***Abington, Massachusetts***, for the contract sum of

____ Dollars*

($____).

*** All entries must be made clearly and in ink.**

B. This sub-bid includes addenda numbered ____________________.

C. This sub-bid

(___) may be used by any general bidder except:

____

____

____

____

(__) may only be used by the following general bidders:

____

____

____

____

(To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.)

D. The undersigned agrees that, if it is selected as a sub-bidder it will, within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested so to do in the general bid by the general bidder, who shall pay the premiums therefor, or if prequalification is required pursuant to section 44D 3/4, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the specifications for this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on its own payroll and in the absence of a contrary provision in the specifications, the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

Name	Class of Work	Bid Price

(Do not give bid price for any class or part thereof furnished by undersigned.)

F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

G. The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore described plans, specifications, including all general and supplemental general conditions stated therein, and addenda, and to assume toward it all the obligations and responsibilities that it, by those documents, assumes toward the Owner.

H. The undersigned offers the following information as evidence of its qualifications to perform the work as bid upon according to all the requirements of the plans and specifications:

1. Have been in business under present business name __________ years.

2. Ever failed to complete any work awarded? __________

3. List one or more recent buildings with names of General Contractor and architect on which you served as a subcontractor for work of similar character as required for the above-named building.

	Building	Architect	General Contractor	Amount of Contract
a.				
b.				
c.				

4. Bank reference ____

I. The undersigned hereby certifies it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee: and that it will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44 F.

J. The undersigned understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 149, Sections 44A to 44J, as amended. Every sub-bidder must furnish the DCAM Sub-bidder Update Statement with the bid.

K. The undersigned agrees to comply with the applicable portions of Division 00 and 01 of the project specifications, and other sections of the specification as referenced. The undersigned also agrees to coordinate all work with that of other trades to avoid conflict of equipment, so that the work of the entire project, including all trades, shall not be delayed or interfered with.

L. Bid security in the form of a bid bond, cash, certified check, treasurer's or cashier's check, payable to the Owner, in a dollar amount of 5 percent of the total bid, in accordance with the conditions in the INSTRUCTIONS TO BIDDERS, has been attached to this bid.

M. The successful sub-bidder shall be required to submit to the General Contractor a signed certification showing compliance with the minority manpower ratios and specific action steps contained in The Commonwealth of Massachusetts Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program reprinted in Section 00830 of this specification.

N. The undersigned further certifies under the penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date:______________________________

____
(Name of Sub-bidder)

By: ______________________________
(Title and Name of Person Signing Bid)

(SEAL - if bid is by
a corporation)

____

(Business Address)

____
(City and State)

____
(Telephone Number)

____
(Fax Number)

SECTION 00 43 43

PREVAILING WAGE RATES

(FORTHCOMING)

SECTION 00 45 13

ATTACHMENT A

GENERAL CONTRACTOR UPDATE STATEMENT

DIVISION OF
CAPITAL ASSET
MANAGEMENT &
MAINTENANCE

PRIME UPDATE STATEMENTS ARE NOT PUBLIC RECORDS AND ARE NOT OPEN TO PUBLIC INSPECTION (M.G.L. C.149, §44D)

TO ALL BIDDERS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED PRIME CONTRACTOR UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY PRIME BID FOR A CONTRACT PURSUANT TO M.G.L. c.149, §44A AND M.G.L. c. 149A. ANY PRIME BID SUBMITTED WITHOUT AN APPROPRIATE UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

Caution: This form is to be used for submitting Prime Contract bids. It is not to be used for submitting Filed Sub-Bids or Trade Sub-Bids.

AWARDING AUTHORITIES

If the Awarding Authority determines that the bidder does not demonstrably possess the skill, ability and integrity necessary to perform the work on the project, it must reject the bid.

BIDDER'S AFFIDAVIT

I swear under the pains and penalties of perjury that I am duly authorized by the bidder named below to sign and submit this Prime Contractor Update Statement on behalf of the bidder named below, that I have read this Prime Contractor Update Statement, and that all of the information provided by the bidder in this Prime Contractor Update Statement is true, accurate, and complete as of the bid date.

Bid Date	Print Name of Prime Contractor
Project Number (or name if no number)	Business Address
Awarding Authority	Telephone Number

SIGNATURE⇨ _______________________________

Bidder's Authorized Representative

INSTRUCTIONS

INSTRUCTIONS TO BIDDERS

- This form must be completed and submitted by all Prime contractors bidding on projects pursuant to M.G.L. c. 149, §44A and M.G.L. c. 149A.
- You must give complete and accurate answers to all questions and provide all of the information requested. MAKING A MATERIALLY FALSE STATEMENT IN THIS UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM ALL PUBLIC CONTRACTING.
- **This Update Statement must include all requested information that was not previously reported on the Application used for your firm's most recently issued (not extended or amended) Prime Contractor Certificate of Eligibility. The Update Statement must cover the entire period since the date of your Application, NOT since the date of your Certification.**
- You must use this official form of Update Statement. Copies of this form may be obtained from the awarding authority and from the Division of Capital Asset Management and Maintenance Web Site: www.mass.gov/DCAMM.
- If additional space is needed, please copy the appropriate page of this Update Statement and attach it as an additional sheet.
- See the section entitled "Bidding Limits" in the *Instructions to Awarding Authorities* for important information concerning your bidding limits.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Bidder Qualifications

- It is the awarding authority's responsibility to determine who is the lowest eligible and responsible bidder. You must consider all of the information in the low bidder's Update Statement in making this determination. Remember: this information was not available to the Division of Capital Asset Management and Maintenance at the time of certification.
- The bidder's performance on the projects listed in Parts 1 and 2 must be part of your review. Contact the project references.
- AWARDING AUTHORITIES ARE STRONGLY ENCOURAGED TO REVIEW THE LOW BIDDER'S ENTIRE CERTIFICATION FILE AT THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE. Telephone (617) 727-9320 for an appointment.

Bidding Limits

Single Project Limit: The total amount of the bid, including all alternates, may not exceed the bidder's Single Project Limit.

Aggregate Work Limit: The annual value of the work to be performed on the contract for which the bid is submitted, when added to the annual cost to complete the bidder's other currently held contracts, may not exceed the bidder's Aggregate Work Limit. Use the following procedure to determine whether the low bidder is within its Aggregate Work Limit:

Step 1 Review Update Statement Question #2 to make sure that all requested information is provided and that the bidder has accurately calculated and totaled the annualized value of all incomplete work on its currently held contracts (column 9).

Step 2 Determine the annual dollar value of the work to be performed on your project. This is done as follows:

(i) If the project is to be completed in less than 12 months, the annual dollar value of the work is equal to the full amount of the bid.

(ii) If the project will take more than 12 months to complete, calculate the number of years given to complete the project by dividing the total number of months in the project schedule by 12 (calculate to 3 decimal places), then divide the amount of the bid by the calculated number of years to find the annual dollar value of the work.

Step 3 Add the annualized value of all of the bidder's incomplete contract work (the total of column 9 on page 5) to the annual dollar value of the work to be performed on your project. **The total may not exceed the bidder's Aggregate Work Limit**.

Correction of Errors and Omissions in Update Statements

Matters of Form: An awarding authority shall not reject a contractor's bid because there are mistakes or omissions of form in the Update Statement submitted with the bid, provided the contractor promptly corrects those mistakes or omissions upon request of the awarding authority. [810 CMR 8.05(1)].

Correction of Other Defects: An awarding authority may, in its discretion, give a contractor notice of defects, other than mistakes or omissions of form, in the contractor's Update Statement, and an opportunity to correct such defects, provided the correction of such defects is not prejudicial to fair competition. An awarding authority may reject a corrected Update Statement if it contains unfavorable information about the contractor that was omitted from the Update Statement filed with the contractor's bid. [810 CMR 8.05(2)].

PART 1 - COMPLETED PROJECTS

LIST ALL PUBLIC AND PRIVATE *BUILDING* PROJECTS YOUR FIRM HAS COMPLETED SINCE THE DATE OF APPLICATION FOR YOUR MOST RECENTLY ISSUED (NOT EXTENDED OR AMENDED) DCAMM CERTIFICATE OF ELIGIBILITY. YOU MUST REPORT ALL REQUESTED INFORMATION NOT PREVIOUSLY REPORTED ON THAT DCAMM APPLICATION*.

PROJECT TITLE & LOCATION	WORK CATEGORY	CONTRACT PRICE	START DATE	DATE COMPLETED

Attach additional sheets if necessary

* If your firm has been terminated from a project prior to completion of the work or has failed or refused to complete its work under any contract, full details and an explanation must be provided. See Part 3 of this Update Statement.

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH COMPLETED PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _______

PART 2 - CURRENTLY HELD CONTRACTS

LIST ALL PUBLIC AND PRIVATE BUILDING AND NON-BUILDING *CONSTRUCTION* PROJECTS YOUR COMPANY HAS UNDER CONTRACT ON THIS DATE REGARDLESS OF WHEN OR WHETHER THE WORK COMMENCED.

1	2	3	4	5	6	7	8	9
PROJECT TITLE & LOCATION	WORK CATEGORY	START AND END DATES	ON SCHEDULE (yes / no)	CONTRACT PRICE	% NOT COMPLETE	$ VALUE OF WORK NOT COMPLETE (col. 5 X col. 6)	NO. OF YEARS REMAINING (see note below)	ANNUALIZED VALUE OF INCOMPLETE WORK (col. 7 ÷ col. 8) (divided by)

ANNUALIZED VALUE OF ALL INCOMPLETE CONTRACT WORK (Total of Column 9) $________

Column 8 • If less than one year is left in the project schedule, write 1.
- If more than 12 months are left in the project schedule, divide the number of months left in the project schedule by 12 (calculate to three decimal places).

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH CURRENTLY HELD PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _______

For **Parts 3 and 4**, if you answer YES to any question, please provide on a separate page a complete explanation. You must report all requested information not previously reported on your most recent DCAMM Application for Prime Certificate of Eligibility. Information must supplement all judicial and administrative proceedings involving bidder's firm, which were instituted or concluded (adversely or otherwise) since your firm's Application for your most recently issued (not extended or amended) Certificate of Eligibility. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

PART 3 – GENERAL PERFORMANCE

Part 3 of the Update Statement corresponds to Section 5 of the Prime Application. The numbering below refers back to the numbered questions in the application for your reference.

Prime Application Section 5 - General Performance

	YES	NO
5.A. Has your Company been terminated prior to completion of a Contract?	☐	☐
5.B. Has your Company failed or refused to perform or complete any of its Scope of Work under any Contract prior to substantial completion?	☐	☐
5.C. Has your Company and/or any principal, officer, or individual with a Financial Interest in your Company filed for bankruptcy?	☐	☐
5.D. Has a surety for your Company taken over or been asked to complete your Scope of Work under any Contract?	☐	☐
5.E. Has a payment or performance bond been invoked against your Company on any Contract?	☐	☐
5.F. Has any surety for your Company made payment under a payment bond to a vendor or supplier or other party on any Contract?	☐	☐
5.G. Has any subcontractor filed a demand for direct payment on any of your Contracts?	☐	☐
5.H. Has a lawsuit been filed by any of your subcontractors or suppliers to enforce a mechanic's lien in connection with any of your Contracts?	☐	☐
5.I. Has there been a death of any Company employee or other person in connection with (or as the result of) performing your Company's Scope of Work on any of your Contracts?	☐	☐
5.J. Has any Company employee or other person suffered an injury while performing any tasks within the Scope of Work on any of your Contracts resulting in his/her inability to return to work for a period in excess of one year?	☐	☐

PART 4 – LEGAL OR ADMINISTRATIVE PROCEEDINGS; COMPLIANCE WITH LAWS

Part 4 of the Update Statement corresponds to section 6 of the Prime Application. The numbering below refers back to the numbered questions in the application for your reference.

Prime Application Section 6 -Legal or Administrative Proceedings; Compliance with Laws

The term "administrative proceeding" as used in this Prime Contractor Update Statement includes (i) any action taken or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code, legal, or contractual requirement, except for those brought in state or federal courts, or (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal or contractual requirement.

The term "anyone with a financial interest in your firm" as used in this Section "I", shall mean any person and/or entity with a 5% or greater ownership interest in the applicant's firm.

	YES	NO
6.A. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to the procurement or performance of any of your Contracts?	☐	☐
6.B. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal construction procurement laws?	☐	☐
6.C. Have any criminal charges involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to the procurement or performance of any of your Contracts (e.g., fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records or receipt of stolen property)?	☐	☐
6.D. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of state ethics laws (in Massachusetts: M.G.L. Chapter 268A)?	☐	☐

Section 6 - Legal or Administrative Proceedings; Compliance with Laws (continued)

	YES	NO
6.E. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker's compensation?	☐	☐
6.F. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in hiring and/or employment?	☐	☐
6.G. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled for violation of any state or federal law regulating labor relations, including collective bargaining agreements, employee welfare benefit plans, employee pension benefit plans, other ERISA and non-ERISA plans?	☐	☐
6.H. Have any proceedings by a local, state, or federal agency been brought, concluded, or settled relating to decertification, debarment or suspension of your Company and/or any principal or officer or individual with a Financial Interest in your Company from construction contracting?	☐	☐
6.I. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of state or federal environmental laws?	☐	☐
6.J. Has your Company been fined or sanctioned by OSHA and/or any other state or federal agency for violations of any laws or regulations related to occupational health or safety?	☐	☐
6.K. Has your Company ever (i) failed to meet applicable workforce and/or diversity program goals, benchmarks or other requirements, and/or (ii) been sanctioned, fined and/or penalized for non-compliance with workforce policies and/or diversity programs (e.g., for MBEs, WBEs, SDVOBEs and DBEs) and/or failure to maintain and/or submit required reports, such as certified payrolls.	☐	☐
6.L. Other than previously reported in the above questions, have any Judicial Actions or Administrative Proceedings or investigations involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?	☐	☐

PART 5 - SUPERVISORY PERSONNEL

List all supervisory personnel, such as project managers and superintendents, who will be assigned to the project if your firm is awarded the contract. **Attach the resume of each person listed below**.

NAME	TITLE OR FUNCTION

PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

Have there been any changes in your company's business organization (**including changes in ownership, mergers, or asset/stock sales**), financial condition or bonding capacity since the date your current Certificate of Eligibility was issued? ☐ Yes ☐ No
If YES, attach a separate page providing complete details.

PART 7 – LIST OF COMPLETED CONSTRUCTION PROJECTS SUBMITTED TO THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE.

Attach here a copy of the list of completed construction projects which was submitted with your firm's DCAMM Application for your most recently issued (not extended or amended) DCAMM Certificate of Eligibility. The Attachment must include a complete copy of the entire Projects Table – "Completed Projects" and the final page – "Certification" (Signature Page) containing the signature and date that the Completed Projects list was submitted to the Division of Capital Asset Management and Maintenance.

SECTION 00 45 13.13

ATTACHMENT A

DCAM SUB-BIDDER UPDATE STATEMENT

DIVISION OF
CAPITAL ASSET
MANAGEMENT &
MAINTENANCE

SUB-BIDDERS' UPDATE STATEMENTS ARE NOT PUBLIC RECORDS AND ARE NOT OPEN TO PUBLIC INSPECTION (M.G.L. C.149, §44D)

Sub-Bidder Update Statement

TO ALL SUB-BIDDERS, TRADE CONTRACTORS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED SUB-BIDDER UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY FILED SUB-BID PURSUANT TO M.G.L. c.149, §44F AND EVERY TRADE SUB-BID PURSUANT TO M.G.L. c. 149A. ANY FILED SUB-BID OR TRADE SUB-BID SUBMITTED WITHOUT AN APPROPRIATE SUB-BIDDER UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

Caution: This form is to be used for submitting Filed Sub-Bids and Trade Sub-Bids Only

AWARDING AUTHORITIES

If the Awarding Authority determines that the Sub-Bidder is not competent to perform the work as specified on the project, it should reject the bid.

SUB-BIDDER'S AFFIDAVIT

I swear under the pains and penalties of perjury that I am duly authorized by the bidder named below to sign and submit this Sub-Bidder Update Statement on behalf of the bidder named below, that I have read this Sub-Bidder Update Statement, and that all of the information provided by the bidder in this Sub-Bidder Update Statement is true, accurate, and complete as of the bid date.

Bid Date

Print Name of Sub-Bidder or Trade Contractor

Project Number
(or name if no number)

Business Address

Awarding Authority

Telephone Number

SIGNATURE⇨

Bidder's Authorized Representative

INSTRUCTIONS

INSTRUCTIONS TO SUB-BIDDERS

- This form must be completed and submitted by all Filed Sub-Bidders bidding on projects pursuant to M.G.L. c. 149, §44F and Trade Contractors bidding on projects pursuant to M.G.L. c. 149A.

- You must give complete and accurate answers to all questions and provide all of the information requested. MAKING A MATERIALLY FALSE STATEMENT IN THIS SUB-BIDDER UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM ALL PUBLIC CONTRACTING.

- **This Sub-Bidder Update Statement must include all requested information that was not previously reported on the Application used for your company's most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. The Sub-Bidder Update Statement must cover the entire period since the date of that Application, NOT since the date of your Certification.**

- You must use this official form of Sub-Bidder Update Statement. Copies of this form may be obtained from the awarding authority or from the DCAMM Web Site: www.mass.gov/DCAMM/certification.

- If additional space is needed, please copy the appropriate page of this Sub-Bidder Update Statement and attach it as an additional sheet.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Sub-Bidder Qualifications

- It is the awarding authority's responsibility to determine each responsible bidder. You must consider all of the information in the bidder's Sub-Bidder Update Statement in making this determination. Remember: this information was not available to the Division of Capital Asset Management and Maintenance at the time of certification.

- The Sub-Bidder's performance on the projects listed in Parts 1 and 2 must be part of your review. Contact the project references.

- Awarding Authorities are strongly encouraged to review the Sub-Bidder's entire certification file at the Division of Capital Asset Management and Maintenance, telephone (857) 204-1305 or via email at certification.DCAMM@mass.gov for an appointment.

Correction of Errors and Omissions in Sub-Bidder Update Statements

Matters of Form: An awarding authority shall not reject a Sub-Bidder's bid because there are mistakes or omissions of form in the Sub-Bidder Update Statement submitted with the bid pursuant to M.G.L. c.149, §44D, provided the Sub-Bidder promptly corrects those mistakes or omissions upon request of the awarding authority. [810 CMR 8.13(1)]

Correction of Other Defects: An awarding authority may, in its discretion, give a Sub-Bidder notice of minor defects and omissions as to form in the Sub-Bidder's Update Statement and provide an opportunity to correct its Sub-Bidder Update Statement. However, the Sub-Bidder shall not be allowed to make corrections to a Sub-Bidder Update Statement if material information about the Sub-Bidder was omitted from the Sub-Bidder Update Statement filed with the Sub-Bidder's bid. The Awarding Authority shall advise DCAMM of any material omissions in a Sub-Bidder's Update Statement. [810 CMR 8.13(2)]

PART 1 - COMPLETED PROJECTS

List All Public And Private Projects Of $20,000 or more your company has completed since the date of application for your most recently issued (not extended or amended) Sub-Bidder Certificate Of Eligibility*.

PROJECT TITLE & LOCATION	WORK CATEGORY	CONTRACT PRICE	START DATE	DATE COMPLETED

Attach additional sheets if necessary

* If your company has been terminated from a project prior to completion of the work or has failed or refused to complete its work under any contract, full details and an explanation must be provided. See Part 3 of this Sub-Bidder Update Statement.

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH COMPLETED PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE		COMPANY NAME	CONTACT PERSON	TELEPHONE	EMAIL ADDRESS
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _______

PART 2 – PROJECTS IN PROGRESS CONTRACTS

List all public and private projects of $20,000 or more your company has under contract on this date regardless of when or whether the work commenced.

1	2	3	4	5	6	7
PROJECT TITLE & LOCATION	WORK CATEGORY	START AND END DATES (MM/YYYY)	ON SCHEDULE (yes / no)	CONTRACT PRICE	% NOT COMPLETE	$ VALUE OF WORK NOT COMPLETE (col. 5 X col. 6)

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH INCOMPLETE PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE		COMPANY NAME	CONTACT PERSON	TELEPHONE	EMAIL ADDRESS
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _______

PART 3 - GENERAL PERFORMANCE

For Parts 3 and 4, if you answer YES to any question, please provide on a separate page a complete explanation. Information you provide herein must supplement the application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. You must report all requested information not previously reported on that application.

Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

	YES	NO
5A. Has your Company been terminated prior to completion of a Contract?	☒	☐
5B. Has your Company failed or refused to perform or complete any of its Scope of Work under any Contract prior to substantial completion?	☐	☐
5C. Has your Company and/or any principal, officer, or individual with a Financial Interest in your Company filed for bankruptcy?	☐	☐
5D. Has a surety for your Company taken over or been asked to complete your Scope of Work under any Contract?	☐	☐
5E. Has a payment or performance bond been invoked against your Company on any Contract?	☐	☐
5F. Has any surety for your Company made payment under a payment bond to a vendor or supplier or other party on any Contract?	☐	☐
5G. Has any subcontractor filed a demand for direct payment on any of your Contracts?	☐	☐
5H. Has a lawsuit been filed by any of your subcontractors or suppliers to enforce a mechanic's lien in connection with any of your Contracts?	☐	☐
5I. Has there been a death of any Company employee or other person in connection with (or as the result of) performing your Company's Scope of Work on any of your Contracts?	☐	☐
5J. Has any Company employee or other person suffered an injury while performing any tasks within the Scope of Work on any of your Contracts resulting in his/her inability to return to work for a period in excess of one year?	☐	☐

PART 4 - Legal or Administrative Proceedings; Compliance with Laws

Please answer the following questions. Information must supplement all judicial and administrative proceedings involving bidder's company, which were instituted or concluded (adversely or otherwise) since your company's Application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. You must report all requested information not previously reported on that DCAMM Application.

The term "administrative proceeding" as used in this Sub-Bidder Update Statement includes (i) any action taken or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code, legal, or contractual requirement, except for those brought in state or federal courts, or (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal or contractual requirement.

The term "anyone with a financial interest in your company" as used in this Section "I", shall mean any person and/or entity with a 5% or greater ownership interest in the applicant's company.

If you answer YES to any question, on a separate page provide a complete explanation of each proceeding or action and any judgment, decision, fine or other sanction or result. Include all details (name of court or administrative agency, title of case or proceeding, case number, date action was commenced, date judgment or decision was entered, fines or penalties imposed, etc.).

	YES	NO
6.A. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to the procurement or performance of any of your Contracts?	☐	☐
6.B. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal construction procurement laws?	☐	☐
6.C. Have any criminal charges involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to the procurement or performance of any of your Contracts (e.g., fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records or receipt of stolen property)?	☐	☐
6.D. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of state ethics laws (in Massachusetts: M.G.L. Chapter 268A)?	☐	☐

PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)

	YES	NO
6.E. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker's compensation?	☐	☐
6.F. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in hiring and/or employment?	☐	☐
6.G. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled for violation of any state or federal law regulating labor relations, including collective bargaining agreements, employee welfare benefit plans, employee pension benefit plans, other ERISA and non-ERISA plans?	☐	☐
6.H. Have any proceedings by a local, state, or federal agency been brought, concluded, or settled relating to decertification, debarment or suspension of your Company and/or any principal or officer or individual with a Financial Interest in your Company from construction contracting?	☐	☐
6.I. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of state or federal environmental laws?	☐	☐
6.J. Has your Company been fined or sanctioned by OSHA and/or any other state or federal agency for violations of any laws or regulations related to occupational health or safety?	☐	☐
6.K. Has your Company ever (i) failed to meet applicable workforce and/or diversity program goals, benchmarks or other requirements, and/or (ii) been sanctioned, fined and/or penalized for non-compliance with workforce policies and/or diversity programs (e.g., for MBEs, WBEs, SDVOBEs and DBEs) and/or failure to maintain and/or submit required reports, such as certified payrolls.	☐	☐
6.L. Other than previously reported in the above questions, have any Judicial Actions or Administrative Proceedings or investigations involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?	☐	☐

PART 5 - SUPERVISORY PERSONNEL

List all supervisory personnel who will be assigned to the project if your company is awarded the contract.

Attach the resume of each person listed below.

NAME	TITLE OR FUNCTION

PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

Have there been any changes in your company's business organization (**including changes in ownership, mergers, or asset/stock sales**), financial condition or bonding capacity since the date your current Certificate of Eligibility was issued? ☐ Yes ☐ No

If YES, attach a separate page providing complete details.

PART 7 – LIST OF COMPLETED CONSTRUCTION PROJECTS SUBMITTED TO THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE ALONG WITH CERTIFICATION SIGNATURE PAGE.

> Attach here a copy of the list of completed construction projects which was submitted with your company's application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. The Attachment must include a complete copy of the entire Completed Projects spreadsheet and the final page Certification (Signature) Page of the online application, containing the signature and date the completed projects list was submitted to the Division of Capital Asset Management and Maintenance.

SECTION 00 52 00

AGREEMENT

THIS AGREEMENT, made this _______ day of ___________________, _____, by and between the____, hereinafter called "OWNER," acting herein through its ____, and _____________________________________doing business as (a corporation) (a limited liability company) (a partnership) (a joint venture) (an individual)* located in the (City) (Town)* of ___ ____________________, County of___________________________, and State of __________ _______, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows:

Phase I – Salt Shed, Fuel Island, and Associated Site Work

hereinafter called the project, for the sum of ____ Dollars and ___________________________ Cents ($______________________________) and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at its own proper cost and expense to furnish superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to complete the said project in accordance with the conditions and prices stated in Section 00 43 13, FORM OF GENERAL BID, Section 00 72 00, GENERAL CONDITIONS, Section 00 73 00, SUPPLEMENTARY CONDITIONS, Section 00 73 73.13, STATE REGULATIONS, the plans, which include all maps, plates, drawings, blue prints, and the specifications and all other contract documents therefor as prepared by Weston & Sampson Engineers, Inc., including all bid documents

The CONTRACTOR hereby agrees to commence work under this contract on or before a date to be fixed in the written Notice to Proceed given by the OWNER to the CONTRACTOR and to fully complete the project within __________ consecutive days of the start date fixed in the Notice to Proceed. The CONTRACTOR further agrees to pay as liquidated damages the sum of $_______ _________________________ for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the Liquidated Damages provisions of Section 00 73 00 SUPPLEMENTARY CONDITIONS.

The CONTRACTOR shall not discriminate against or exclude any person from participation herein on grounds of race, color, religious creed, national origin, sex, sexual orientation, ancestry, or age; and that it shall take affirmative actions to insure that applicants are employed, and that employees are treated during their employment, without regard to race, color, religious creed, national origin, sex, sexual orientation, ancestry, age, or handicapped status.

The CONTRACTOR shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Agreement and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

Subject to G.L. c.30, sec. 39K and/or sec. 39G and G.L. c.30, sec. 39F, as applicable, the OWNER agrees to pay the CONTRACTOR in current funds for the performance of the Agreement, subject to additions and deductions, as provided in Section 00 72 00, GENERAL CONDITIONS, and to make payments on account thereof as provided in Section 00 72 00, GENERAL CONDITIONS and Section 00 73 00, SUPPLEMENTARY CONDITIONS

In accordance with the requirements of G.L. c.149, §27B, the Contractor shall submit, and shall require all of its subcontractors required to keep a record of hours and wages paid to laborers employed on the project to submit, to the awarding authority on a weekly basis, copies of such records. All such weekly submissions shall be accompanied by the following certification:

> The undersigned contractor hereby certifies, under the pains and penalties of perjury, that the foregoing payroll records are true and accurate records of the wages paid to laborers employed on the project for the period stated and said wages are in an amount no less than the prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned contractor agrees, in addition to any other remedies available to the awarding authority, to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the contractor's failure to pay laborers employed on the project the said applicable prevailing wage rates; (2) the failure of the foregoing payroll records to accurately state the said applicable prevailing wage rates; or (3) the failure of the foregoing payroll records to accurately represent the wages actually paid to laborers employed on the project.

The Agreed upon DIRECT LABOR MARKUP (percentage) for Change Orders on this project shall be ___________ percent.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

AGREED:

____ , Massachusetts
(Owner)

By ____

____
(Name)

____
(Title)

____
(Contractor)

By ____

____
(Name)

____
(Title)

____
(Address)

____
(City and State)

Approved as to Form:

By____
(Owner's Counsel)

____
(Name)

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this Contract is available therefor and that the ________________ has been authorized to execute the Contract and approve all requisitions and change orders.

By____
(Owner's Accountant)

____
(Name)

CERTIFICATE OF VOTE

(to be filed if Contractor is a Corporation)

I, ____________________, hereby certify that I am the duly qualified and acting Secretary of
(Secretary of Corporation)
________________________ and I further certify that a meeting of the Directors of said company,
(Name of Corporation)
duly called and held on ________________, at which all members were present and voting, the
(Date of Meeting)
following vote was unanimously passed:

VOTED: To authorize and empower

____

____

____

____

____

Anyone acting singly, to execute Forms of General Bid, Contracts or Bonds on behalf of the Corporation.

I further certify that the above vote is still in effect and has not been changed or modified in any respect.

By:____
(Secretary of Corporation)

A True Copy:

Attest: ____
(Notary Public)

My Commission Expires:_________________________
(Date)

Contractor's Certification

A Contractor will not be eligible for award of a contract unless such Contractor has submitted the following certification, which is deemed a part of the resulting contract:

CONTRACTOR'S CERTIFICATION

____
Name of the General Contractor

certifies that it:

1. Will not discriminate in their employment practices;
2. Intends to use the following listed construction trades in the work under the contract:

____

____

and

3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and
4. Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and
5. Will provide the provisions of the “Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program” to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.
6. Agrees to comply with all provisions contained herein.

____
Signature of authorized representative of Contractor Date

____
Printed name of authorized representative of Contractor

Contractor's Certification (Continued)

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean natural person, business, partnership, corporation, committee, union, club or other organization, entity, or group of individuals.

Signature______________________________ Date________________________________

______________________________________ ____________________________________
Print Name & Title Company Name

CERTIFICATE OF TAX COMPLIANCE

Pursuant to Chapter 62C of the Massachusetts General Laws, Section 49A (b), I

_____________________________, authorized signatory for ______________________________
Name of individual *Name of contractor*
do hereby certify under the pains and penalties of perjury that said contractor has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

_____________________________________ _____________________
Signature Date

LABOR HARMONY AND OSHA TRAINING REQUIREMENTS

The undersigned certifies under penalties of perjury that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed at the work ***and*** that all employees to be employed at the worksite and in the work will have completed an OSHA-approved construction safety and health course lasting at least ten (10) hours.

Signature______________________________ Date__________________________________

______________________________________ _____________________________________
Print Name & Title Company Name

Subcontractor's Certification

Prior to the award of any subcontract, regardless of tier, the prospective subcontractor must execute and submit to the General Contractor the following certification, which will be deemed a part of the resulting subcontract:

SUBCONTRACTOR'S CERTIFICATION

____
Name of the Subcontractor

certifies that it:

1.Will not discriminate in their employment practices;

2.Intends to use the following listed construction trades in the work under the contract:

____

____

and

3.Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and

4.Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and

5.Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.

6.Agrees to comply with all provisions contained herein.

____
Signature of authorized representative of Subcontractor Date

____
Printed name of authorized representative of Subcontractor

END OF SECTION

SECTION 00 52 00.13

SUBCONTRACT FORM

THIS AGREEMENT MADE THIS ____ DAY OF __________, _____, by and between
(Month) (Year)

_________________, a corporation organized and existing under the laws of _________, an individual doing business as_________________, hereinafter called the "Contractor," and a corporation organized and existing under the laws of ___________, an individual doing business as _______________________, hereinafter called the "Subcontractor."

WITNESSETH that the Contractor and the Subcontractor for the considerations hereafter named, agree as follows:

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work specified in Section No. ________, _________ of the specifications for ___________________________ and the plans referred to therein and addenda No. ___, ___,___,
(Name of Sub-Trade)
and ___ for the ____
(complete title of the project and the project no. taken from the title page of the specifications)
all as prepared by Weston & Sampson Engineers, Inc. for the sum of ________________ Dollars ($__________) and the Contractor agrees to pay the Subcontractor said sum for said work. This price includes other items set forth in the sub-bid, if applicable:

(a) The Subcontractor agrees to be bound to the Contractor by the terms of the hereinbefore described plans, specifications (including all general conditions stated therein) and addenda No. , and ___, and ___, and to assume to the Contractor all the obligations and responsibilities that the Contractor by those documents assumes to the_______________________
(Awarding Authority)
hereinafter called the "Awarding Authority," except to the extent that provisions contained therein are by their terms or by law applicable only to the Contractor.

(b) The Contractor agrees to be bound to the Subcontractor by the terms of the hereinbefore described documents and to assume to the Subcontractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the

Contractor, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority.

2. The Contractor agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Subcontractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the Contractor, either oral or in writing, the Subcontractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Subcontractor agrees to furnish to the Contractor within a reasonable time after the execution of this subcontract, evidence of workers' compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the Contractor.

4. The Contractor agrees that no claim for services rendered or materials furnished by the Contractor to the Subcontractor shall be valid unless written notice thereof is given by the Contractor to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. This agreement is contingent upon the execution of a general contract between the Contractor and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the date and year first above-written.

SEAL
ATTEST___________ ____
(Name of Subcontractor)

By____

SEAL
ATTEST___________ ____
(Name of Contractor)

By____

SECTION 00 63 63

STATE REGULATIONS

ATTACHMENT D

CHANGE ORDERS

Policy:

This section supplements Article 11, Changes to the Contract, in the General Conditions and Supplementary Conditions.

All executed change orders submitted to the Engineer for review and processing must be prepared in accordance with the attached change order format (Appendix A) with the appropriate number of copies, calculation sheet(s) (Appendix B) and all other supporting documentation necessary for evaluation. Failure to comply with these instructions will result in delays in processing the change order.

In order to avoid possible delays with approval of change orders, at the beginning of the project and as circumstances warrant, the Contractor shall submit a list of construction equipment, identifying major pieces of equipment to be utilized on the project. The list shall include the Contractor's designation, if any, the manufacturer, model, year of manufacture, serial number, size and horsepower of equipment. The Contractor shall also provide for approval a proposed bluebook equipment rental rate development that separately lists for each piece of equipment the monthly rental rate, area adjustment factor, depreciation factor, estimated operating cost per hour and total hourly rate. In the event the Contractor fails or is unable to provide appropriate rate information the Engineer may develop equipment rental rates for use on change orders.

Payment of Change Orders:

Payment of all change orders shall be in accordance with the relevant provisions of Massachusetts General Laws, Chapter 30, Section 39G for non-building construction and Section 39K for building construction as amended from time to time.

Payment of change orders shall be made in accordance with one of the following three methods:

A. Existing unit prices as set forth in the contract; or

B. Agreed upon lump sum or unit prices; or

C. Time and materials

A. Payment for work for which there is a unit price in the contract:

Where the contract contains a unit price for work and the Engineer orders a change for work of the same kind as other work contained in the contract and is performed under similar physical conditions, the Contractor shall accept full and final payment at the contract unit price(s) for the acceptable quantities. Under certain circumstances, the unit prices may be subject to revaluation and adjustment. See Article 13 in the Supplementary Conditions.

B. Payment for work or materials for which no price is contained in the contract:

If the Engineer directs, the Contractor shall submit promptly in writing to the Engineer an offer to do the required work on a lump sum or unit price basis, as specified by the Engineer. The stated price, either lump sum or unit price, shall be divided so as to show that it is the sum of:

1. The estimated cost of Labor, plus
2. Direct Labor Cost, plus
3. Material and Freight Costs, plus
4. Equipment Costs, plus
5. An amount not to exceed 20% of the sum of items 1 through 4 for overhead and profit, plus (if applicable),
6. In the case of work done by a subcontractor an amount not to exceed 7 ½%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credits for work deleted from the contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

C. Payment for work on a time and materials basis:

Unless an agreed lump sum and/or unit price is obtained as noted above and is so stated in the change price, the Contractor shall accept as full payment for which no agreement is contained in contract, an amount equal to:

1. The estimated cost of Labor, plus
2. The Direct Labor Costs, plus
3. Equipment Costs, plus
4. Material and Freight Costs, plus
5. An amount not to exceed 20% of the sum of items 1 through 4 for overhead and profit, plus, if applicable,
6. In the case of work done by a subcontractor an amount not to exceed 7 ½%, for the

general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),

7. Credit for work deleted from the Contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

Explanation of items 1 through 7 as outlined in "B" and "C" above:

1. Labor - Only those workers employed on the project who are doing the extra work, including the foreman in charge, are allowable. General foremen, superintendents, or other supervisory personnel are considered to be included in the overhead markup as provided in items 5 and/or 6. Hourly labor rates in excess of those as listed in the contract wage rates require documentation. As a minimum, an explanation and the appropriate copy of the certified payroll are required.

2. Direct Labor Costs - These costs are limited to those which are required in the contract document. Coverage in excess of the contract provisions, secured by the contractor/subcontractor(s) at his option, are ineligible. The following list of typical direct labor charges is provided for your assistance and is in no way intended to be complete or all encompassing:

   Workman's Compensation

   Federal/State: Social Security Tax and Unemployment Tax;

   Health, Welfare and Pension Benefits; (this cost is included in the wage rates appearing in the Attachment A Massachusetts Wage Rates.

Liability insurance:	Bodily injury; excess umbrella; property damage; public liability
Blasters insurance:	If applied to any required direct labor costs
Builders risk insurance:	If applied to any required direct labor costs
Experience modification insurance:	If applied to any required direct labor costs
Surcharges:	If applied to any required direct labor costs

Following award and prior to execution of a construction contract, the Contractor and filed subbidders (where applicable) shall submit for review by the Owner, documentation to establish the markup percentage(s).

The documented direct labor markup for this contract may be adjusted on an annual basis as measured from the date the contract is executed. The contract agreement will provide for the establishment of the Direct Labor Cost percentage.

3. Material and Freight - Only those materials required as a result of the change order and reasonable freight charges for delivery of same are allowable.

4. Equipment - Only the equipment required as a result of the change order is allowable. Equipment rental rates shall be governed by the current EquipmentWatch, division of Intertec Publishing [Formerly Nielson/Dataquest] Rental Rate Bluebook for Construction Equipment (the "Bluebook"). In determining the rental rate the following shall apply:

   a. For equipment already on the project - the monthly prorated rental rate by the hourly use shall be applicable;

   b. For equipment not on the project the daily rate, the weekly rate, or monthly rate will prevail, whichever will prove to be most cost effective. Small tools and manual equipment are examples of costs not allowable under this item. These costs are considered to be included in the overhead markup as provided in items 5 and/or 6.

(1 Month (Normal Use) = 176 hours)

5.& 6. Overhead and Profit - All other costs not previously mentioned are considered to be included in this item, be it for the general contractor or subcontractor(s).

7. Credits - Work deleted, material and equipment removed from the contract, stored and/or returned shall be credited to the cost of the change order, less documented costs.

   This change order will be prepared in such manner as to clearly separate Eligible and Ineligible Costs (as applicable to state-funded projects).

The Contractor shall furnish itemized statements of the cost of the work ordered and shall give the Engineer access to all accounts, bills and vouchers relating thereto; and unless the Contractor shall furnish such itemized statements, and access to all accounts, bills and vouchers, he shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer.

APPENDIX A

Change Order

Sheet__of__

(Enter Project Name)
(Enter Location)

Date____

Project No. ____________________________________

Contract No. ___________________________________

Change Order No. _______________________________

Contract Amount (As Bid)	$________________
Amount of Previous Change Orders	$________________
Net Change in Contract Price (this Change Order)	$________________
Total Adjusted Contract Price (including this Change Order	$________________

This Change Order extends the time to complete the work by ____ calendar days.

The extended completion date is __________________________________ ______.

This Change Order checked by: ____________________________
Resident Representative Date

This Change Order is requested by: __________________________

This Change Order is recommended by:

____
Consultant Engineer P.E. # Date

The undersigned agree to the terms of the Change Order.

____
Contractor Date

____
Owner Date

Certification of Appropriation under M.G.L. c.44, s.31C: Adequate funding in an amount sufficient to cover the total cost of this change order is available.

By: ________________________________ ______________
Certification Officer (Auditor, Accountant, Treasurer) Date

Do not write below this space: this space reserved for TOWN APPROVAL

CHANGE ORDER (continued) Sheet___of __

(Enter Project Name)

(Enter Location)

Date____

Project No. ______________________________________

Contract No. ______________________________________

Change Order No. __________________________________

Owner's Name: ____________________________________

Owner's Address: __________________________________

Contractor's Name: ________________________________

Contractor's Address: ______________________________

Item 1:

Description of Change:____________________________

Reason for Change:______________________________

Backup Information:_____________________________

Cost: $______________________________________

Item 2

Description of Change:____________________________

Reason for Change:______________________________

Backup Information:_____________________________

Cost: $______________________________________

Appendix B

Example Calculation Sheet

1. Labor

Foreman	10 hours @	$10.00/hour	$100.00
Engineer	10 hours @	8.80/hour	85.00
Operator	10 hours @	9.50/hour	95.00
Laborers	24 hours @	7.00/hour	168.00
			$448.00

2. Direct Labor Cost (use the agreed upon Direct Labor Cost)

*(30)% of $448.	
*(used for example purposes only)	$ 134.00

3. Materials & Freight

150 1.f. of 12" pipe @ $2.00/1.f.	$ 300.00
15 v.f. precast SMH	1,700.00
Freight (slip#___ enclosed)	25.00
	$2,025.00

4. Equipment

1 Backhoe	[illegible] hours @	$ 80.00/hour	$ 800.00
1 Truck-crane	[illegible] hours @	100.00/hour	1000.00
			$1800.00

EXAMPLE

TOTAL (items 1 through 4):	**$4,407.00**

5. (20%) markup for Overhead, Profit

(20%) of $4,407	$ 881.00

6. (7½ %) markup on subcontractor's cost for general contractor (if subcontractor is involved)

(7½ %) of $4,407	$ 331.00

7. Credits (deductibles)	-$323.00
TOTAL COST:	**$5,296.00**

Reminder: Provide support documentation as necessary i.e. vouchers, correspondence, calculation, photographs, reports**.**

END OF SECTION

SECTION 00 72 00

GENERAL CONDITIONS OF THE CONTRACT FOR THE CONSTRUCTION
AIA DOCUMENT A201-2017

AIA Document A201® – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
Abington- Phase 1 Salt Shed, Fuel Island & Associated Site Work
225 Central Street
Abington, MA 02351

THE OWNER:
(Name, legal status and address)
Town of Abington
500 Gliniewicz Way
Abington, MA 02351

THE ARCHITECT:
(Name, legal status and address)
Weston & Sampson Engineers, Inc.
100 Foxborough Blvd, Suite 250
Foxboro, MA 02035

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the

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portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall

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continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required

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submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop

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Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a

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party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed.

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However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

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§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

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§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

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§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon

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compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a separate contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the

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Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

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§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract

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Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents; or
.3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in

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whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

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§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional

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insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

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§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

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§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be

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sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

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§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

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§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

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§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

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PAGE 1

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(Signed)

____

(Title)

____

(Dated)

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TOWN OF ABINGTON
PHAS I – SALT SHED, FUEL ISLAND, AND ASSOCIATED SITE WORK

SUPPLEMENTARY CONDITIONS

Amending the 00 72 00 General Conditions of the Contract for Construction
AIA Document A201 (2017 edition)

I. SUPPLEMENTARY CONDITIONS

The following addendum supplements, modifies, deletes and/or adds to the General Conditions. Where any Article, Paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such Article, Paragraph, or Subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any Article, Paragraph, or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such Article, Paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

II. MODIFICATIONS TO VARIOUS ARTICLES OF THE AIA CONDITIONS

ARTICLE 1 GENERAL PROVISIONS

1.1.1 In the first sentence, delete "are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and" after "The Contract Documents".

Insert "between the Owner and Contractor (hereinafter the Agreement)" after "consist of the Agreement".

In the last sentence:

Delete "Unless specifically enumerated in the Agreement".

Delete "not" after "Contract Documents do".

Delete "other" after "sample forms,".

Delete "or" after "or proposal," and insert "and".

Delete "bidding or proposal requirements" after "relating to" and insert "those documents."

1.1.8 Delete “Claims” and insert “claims”.

Delete “and shall not be liable for results of interpretations or decision rendered in good faith.”.

1.2.11 Add to the end of the sub-section:

All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of Work unless otherwise directed by written addendum to the Contract.

1.2.1 Add to the end of the sentence:

, except that the performance of filed sub-trade work shall comply with the provisions of chapter 149 of the General Laws of the Commonwealth of Massachusetts. The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the Work of the mechanical, electrical and other specialized trades, and to all of the Sections of the Specifications, and shall perform all Work reasonably inferable therefrom as being necessary to produce the indicated results.

1.2.4 -1.2.11 Add the following new sub-sections 1.2.4 to 1.2.11 as follows:

§ 1.2.4 All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

§ 1.2.5 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

§ 1.2.6 Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

§ 1.2.7 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

§ 1.2.8 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work. Such Work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence. A copy of the drawings shall be submitted to the Architect, and the Contractor shall revise and resubmit the drawings if so directed by the Architect.

§ 1.2.9 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in subparagraph 3.2.5 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.

§ 1.2.10 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architects in the design of the Project or Work. The Owner does not hold out such information to the Contractor as a completely accurate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in subparagraph 3.7.4.

§ 1.2.11 Where the Work is to fit with existing conditions or work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or work, unless otherwise specified. Owner provided drawings showing existing conditions or construction are based on available documents and are not guaranteed to show actual existing conditions.

1.5.1 Delete 1.5.1 and replace as follows:

§ 1.5.1 All Drawings, Specifications and copies thereof furnished by the Owner are and shall remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without the prior written consent of the Owner. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

1.8 Delete “using or relying party’s” in Section 1.8 and replace with “Contractor’s”

ARTICLE 2 OWNER

2.1.2 Delete sub-section 2.1.2.

2.2.1 - 2.2.4 Delete subsections 2.2.1 through 2.2.4

2.3.5 Delete the last sentence.

2.3.6 Add to the end of the sub-section as follows:

> All additional copies will be furnished upon request at the cost of reproduction.

2.4 Delete from the last sentence “, except to the extent required by Section 6.1.3” and add as follows:

> The Contractor shall resume the Work after such stoppage promptly upon written notice to do so from the Owner. The Contractor shall remain responsible for maintaining the progress of the Work and shall not be entitled to any increase in the Contract Sum or Contract Time. The Contractor shall be responsible for all costs incurred by the Owner attributable to such an order to stop the Work.

2.5 Add to the end of the section as follows:

> The rights of the Owner hereunder are in addition to any other rights set forth in the Contract Documents or available at law or in equity.

ARTICLE 3 CONTRACTOR

3.2.1 Delete “generally” after “the site, become”.

Add to the end of the sub-section as follows:

> The Contractor shall not be entitled to any change in the Contract Time or Contract Sum on account of its failure, or that of any Subcontractor, to comply with the foregoing requirements.

3.2.2 Delete the beginning of the second sentence as follows:

> These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however,

Delete the last sentence and replace as follows:

> If the Contractor performs any construction activity that it knows or should know involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear responsibility for the costs of any required correction.

3.2.3 Delete "not" after "Contractor is".

Delete ", but" after "public authorities" and create new sentence beginning with "The Contractor shall promptly".

3.2.4 Delete "claims" after "the Contractor shall submit" and insert "a claim".

Delete the last sentence.

3.2.5 Add new sub-section 3.2.5 as follows:

> § 3.2.5 Any claim by the Contractor or Subcontractors that, in submitting their respective bids, they did not include all items as shown in the Contract Documents will be given no consideration for an adjustment of any kind. If any item is specified in a Section which would not normally furnish this item it shall be the responsibility of the Contractor to coordinate the situation with the Subcontractor, and if the item under consideration is not to be provided by the Subcontractor it shall be the responsibility of the Contractor to provide the work in question, without any additional cost to the Owner.

3.3.1 Add to the end of the first sentence as follows:

> which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall adequately staff the Project to properly and thoroughly manage, schedule and supervise all construction activities.

3.3.2 Add the last sentence as follows:

This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the Work.

3.4.3 Add to the end of the second sentence as follows:

, and the Contractor shall ensure that all workers to be employed on the Project have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) of at least 10 hours. The Contractor shall be responsible for maintaining all safety precautions at and around the Project site. On the Owner's request, the Contractor shall permanently remove from the Project site any employee of the Contractor or any Subcontractor who fails to comply with the requirements of the Contract Documents or whose presence or behavior is deemed by the Owner to be adverse to the success of the Project or the Owner's interests.

3.5 Add to the end of the first sentence as follows:

and, promptly after written notification of non-conformance, shall be repaired or replaced by the Contractor with Work conforming to such requirements.

Delete the second to last sentence.

3.5.3 -3.5.9 Add new sub-sections 3.5.3 to 3.5.9 as follows:

§ 3.5.3 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.

§ 3.5.4 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval and request approval of the deviation.

The Architect shall judge the design and appearance of proposed substitutes, an may refuse to approve any substitute which, in the Architect's opinion, would be out of character or otherwise inconsistent with the character or quality of design of the Project.

§ 3.5.5 In informing the Architect of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable in accordance with the Contract Documents. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

§ 3.5.6 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.

§ 3.5.7 The warranty provided in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

§ 3.5.8 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.

§3.5.9 The Contractor shall guarantee all Work for a period of one year after Date of Substantial Completion, or by the terms of any special guarantee required by the Contract Documents. The Contractor shall, upon written notice from the Owner, promptly correct defective Work or Work not in accordance with the Contract Documents.

3.6.1 Add new sub-section 3.6.1 as follows:

§ 3.6.1 The project is exempt from the Massachusetts Sales Tax to the extent permitted by G.L. c.64H, §6(f). The exemption number will be provided by the Awarding Authority to the Contractor.

3.7.2 Add to the end of the sub-section as follows:

If any of the Work is required to be inspected or approved by any public authority, the Contractor shall cause such inspection or approval to be performed and shall comply with any instructions or corrections ordered by the public authority.

3.7.3 Delete “knowing it” after “performs Work” and replace with “it knows or should know”.

3.7.4 Delete sub-section 3.7.4 and replace as follows:

§ 3.7.4 Concealed or Unknown Conditions. Claims for concealed or unknown conditions shall be governed by Chapter 30, Section 39N of the General Laws of the Commonwealth of Massachusetts, as amended.

3.7.5 Delete second and last sentences.

3.8 Delete section 3.8 in its entirety.

3.9.1 In the first sentence:

Insert “, in accordance with the Contract Documents,” after “shall employ”.

Insert “at all times” after “the Project site”.

3.9.4 -3.9.5 Add new sub-sections 3.9.4 and 3.9.5 as follows:

§ 3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

§ 3.9.5 The Contractor shall arrange for and attend job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

3.10.1 In the first sentence delete “promptly” after “The Contractor” and replace with “within twenty (20) days”.

In the second sentence, insert “or as requested by the Architect” after “conditions of the Work and Project”.

Add to the end of the sub-section as follows:

> The construction schedule shall be in such form and contain such information as the Architect and Owner require. The construction schedule shall be resource loaded for the Contractor and all subcontractors, with each resource identified by name, description, unit of measure, and calendar assignment. For each class of work included in the Contractor’s schedule of values, the construction schedule shall show the percentage of completion to be obtained and the total dollar value of the work to be completed as of the first of each month until Substantial Completion. All calculations shall be on the basis of work in place, but not including the value of materials delivered but not in place.

3.10.3 Add to the end of the sub-section as follows:

> The Contractor’s compliance with the construction schedule is a material obligation of the Contract.

3.10.4 -3.10.6 Add new sub-sections 3.10.4, 3.10.5, and 3.10.6 as follows:

> § 3.10.4 The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The construction schedule shall be updated every month (or more frequently if requested by the Owner) to reflect actual conditions (such updates are sometimes referred to in these General Conditions as "progress reports"). In the event any progress report indicates delays in achievement of any milestone date set forth in such schedule, the Contractor shall propose in written form an affirmative plan (the "Recovery Schedule") to correct the delay, including overtime and/or additional labor, if necessary, which Recovery Schedule shall indicate the date by which the progress of the Work will comply with the construction schedule, and shall be subject to the approval of the Owner and the Architect. In no event shall any progress report or Recovery Schedule constitute an adjustment in the construction schedule, Contract Time or any milestone date unless any such adjustment is agreed to by the Owner and authorized pursuant to a Change Order.

§ 3.10.5 In the event (i) that the performance of the Work, as of a milestone date, has not progressed or reached the level of completion required by the construction schedule, and (ii) the progress of the Work is not brought back into compliance with the construction schedule on the date proposed by the Recovery Schedule, or the Contractor otherwise fails to comply with the Recovery Schedule, the Owner shall have the right to order the Contractor to take corrective measures to expedite the progress of the Work, including, without limitation, (1) supplying additional manpower, equipment, and facilities, (2) working additional shifts or overtime, (3) working additional days, and (4) other similar measures (hereinafter referred to collectively as "Corrective Measures"). Such Corrective Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents.

§ 3.10.6 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Corrective Measures required by the Owner under or pursuant to Section 3.10.5. The Owner may exercise the rights furnished the Owner under or pursuant to Section 3.10.5 as frequently as reasonably necessary to ensure that the Contractor's performance of the Work complies with the milestone dates set forth in the construction schedule.

3.12.6 Add to the end of the sub-section as follows:

By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals the Contractor thereby represents that the Contractor has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, Samples, or similar submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

3.12.10 Add to the end of the last sentence as follows:

, except as provided in Section 3.2.

3.12.10.2 Add to the end of subsection 3.12.10.2 the following:

When professional certification of materials, systems or equipment is required by the Contract Documents, the Owner shall be entitled to rely upon such certifications, and neither the Owner nor the Architect shall be expected to make an independent examination with respect to the performance of such materials, systems or equipment.

3.13 Add to the end of the section as follows:

> The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times with the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Owner shall not be liable to the Contractor, the Subcontractors, their employees, or anyone else with respect to the conditions of the premises, except only for a condition caused directly and solely by the negligence of the Owner.

3.15.1 Add “site” to the end of the second sentence.

3.15.2 Add to the end of the sentence as follows:

> , and may deduct all costs thereof from any payment due the Contractor.

3.16 Insert “, Owner’s representatives” after “provide the Owner”.

3.18.1 Delete the first sentence and replace as follows:

> To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect’s consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the Work, including claims, damage, loss or expense attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the Work, caused in whole or in part by the negligent or wrongful acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations, including those of indemnity, which would otherwise exist as to a party or person described in this section.

ARTICLE 4 ARCHITECT

4.1.2 In the first sentence delete “, Contractor” after “consent of the Owner”.

In the second sentence insert “of the Owner” after “Consent”.

4.1.3 Delete sub-section 4.1.3.

4.2.3 In the first sentence delete “reasonably” after “will keep the Owner”.

4.2.4 Delete the second sentence.

4.2.10 Delete sub-section 4.2.10.

4.2.11 Add to the end of the sub-section as follows:

> The parties agree that the Architect’s duties under this subparagraph shall be governed by Chapter 30, Section 39P of the General Laws of the Commonwealth of Massachusetts, as amended.

4.2.12 Delete the second sentence.

ARTICLE 5 SUBCONTRACTORS

5.2.1 Delete the last sentence.

5.2.2 In the second sentence insert “and legally permissible” after “has made reasonable”.

5.2.3 Delete the last two sentences and replace as follows:

> No increase in the Contract Sum or Contract Time shall be allowed for such change.

5.2.4 Add to the end of the sub-section as follows:

> The applicable provisions of Chapter 149, Section 44F of the General Laws of the Commonwealth of Massachusetts shall apply to filed sub-bid subcontractors.

5.4.1 In sub-heading .1 delete “Section 14.2” and replace with “Article 14”.

Add new sub-heading .3 as follows:

> .3 The Owner may further assign the subcontract to a successor contractor or other entity.

Delete last sentence of sub-section.

5.4.2 -5.4.3 Delete sub-sections 5.4.2 and 5.4.3.

ARTICLE 6 CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

6.1.1 At the end of the second sentence delete "including those provisions of the Conditions under the Contract related to insurance and waiver of subrogation".

6.1.4 Delete sub-section 6.1.4 and replace as follows:

> § 6.1.4 The Owner reserves the right to enter any part of the Project site at any time to inspect the Work or to perform other work with its own forces or separate contractors, or to address any emergency situation. Such access is not to be construed to mean partial occupancy by the Owner and no claim for increase in the Contract Time or Sum will be considered unless such Owner's contractors have delayed or damaged the Contractor's Work. The Contractor shall permit the Owner to place and install as much furniture, equipment and other material during the progress of the Work as is possible before completion of the various parts of the Work and agrees that such placing and installation of equipment shall not in any way evidence the completion or acceptance of the Work or any portion of it.

6.2.2 Delete the last sentence.

6.2.3 Delete the last sentence.

6.2.5 Delete sub-section 6.2.5.

ARTICLE 7 CHANGES IN THE WORK

7.2.2 Add new sub-section 7.2.2 as follows:

> § 7.2.2 Upon request of the Owner or the Architect, the Contractor shall without cost to the Owner submit to the Architect, in such form as the Architect may require, an accurate written estimate of the cost of any proposed extra Work or change. The estimate shall indicate the quantity and unit cost of each item of material, and the number of hours of work and hourly rate for each class of labor, as well as a description and the amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of material shall be shown if required by the Architect. The Contractor shall promptly revise and resubmit each estimate if the Architect determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Architect, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Architect

bona fide proposals from recognized suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.

7.3.3 Delete the first sentence of the sub-section and replace as follows:

> If the Construction Change Directive provides for an adjustment to the Contract Sum, and if the Contract Documents include a unit price for the work that is the subject of such directive, such unit price shall be the basis of the adjustment to the Contract Sum, unless the Owner, in its sole discretion, chooses another method. If, however, the Contract Documents do not include a unit price for such work, the adjustment shall be based on one of the following methods, as selected by the Owner:

In sub-heading .2 delete “stated in the Contract Documents or” after “Unit prices”.

7.3.4 Delete first sentence and replace as follows:

> If the proposed method of adjustment in the Contract Sum is based on unit prices that are stated in the Contract Documents, such unit prices shall be the basis of any adjustment to the Contract Sum, unless the Owner has chosen another method pursuant to subparagraph 7.3.3. If the proposed method of adjustment is not based on such unit prices and the Contractor objects to the proposed method of adjustment, the Contractor must notify the Architect of such objection in writing within five (5) calendar days from Contractor’s receipt of the Construction Change Directive. Failure to so object will irrevocably waive any such objections and claims on account of such method of adjustment, and the Construction Change Directive shall be deemed and shall constitute a Change Order. If the Contractor does so object, the adjustment to the Contract Sum shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit.

In sub-heading .4 insert “and” after “and insurance,” and delete “, and sales, use or similar taxes related to the Work” after “permit fees”.

Delete sub-heading .5 and replaces as follows:

.5 A reasonable allowance for overhead and profit.

7.3.6 In the first sentence add after “the Work involved and” as follows:

> , within five (5) calendar days from receipt of the Construction Change Directive,”

Insert “by written notice” after “advise the Architect”.

Add to the end of the sub-section as follows:

> Failure to so advise the Architect within such 5-day period (1) shall be interpreted as Contractor’s agreement with the proposed method of adjustment; (2) shall constitute an irrevocable waiver of any right of the Contractor to submit a claim on account of the method of adjustment; and (3) shall cause the Construction Change Directive to be deemed and constitute a Change Order.

7.3.7 In the second sentence delete “recorded as” after “immediately shall be” and replace with “deemed and shall constitute”.

7.3.9 Delete the end of the first sentence starting after “Directive to the Owner,” and replace as follows:

> amounts for such changes in the Work shall not be included in Applications for Payment. Such amounts shall only be included in an Application for Payment after the adjustment for the Construction Change Directive has been included in a Change Order signed by the Owner and the Contractor.

ARTICLE 8 TIME

8.2.2 In the first sentence delete “, except by agreement or instruction of the Owner”

8.2.4 -8.2.5 Add new sub-sections 8.2.4 and 8.2.5 as follows:

> § 8.2.4 Unless specifically required by law, no payment under this Contract shall be due until the construction schedule, required by Section 3.10, and conforming to the requirements of the General Requirements has been accepted by the Architect.
>
> § 8.2.5 If the Architect in reviewing any Application for Payment determines that the amount of completed Work in place as certified by the Architect is less than 90% of the Work in place required by the Contractor’s construction schedule or schedule of values provided for in Section 9.2, or that there have been delays to critical paths and the Contract completion date will not be met, or that, in the Owner’s sole discretion, there is reasonable concern that the Work will not be

Substantially Complete by the date required in the Contract Documents, the Contractor shall be required to submit a recovery schedule with a written description of the steps the Contractor intends to take to put the Project back on schedule. At the Owner's option, the Contractor shall take some or all of the following actions at no additional cost to the Owner:

.1 Increase the number of workers on the site, in such quantities and trades as will substantially eliminate the backlog of work;

.2 Increase the number of working hours per shift, shifts per day, working days per week, amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate backlog of work; or

.3 Reschedule activities so that the completion dates initially scheduled will be met.

8.3.1 Insert "(except weather)" after "casualties" and delete "adverse weather conditions documented in accordance with Section 15.1.6.2"

Delete "pending mediation and binding dispute resolution" after "delay authorized by Owner".

Add to the end of the sub-section as follows:

> , and this shall be the Contractor's sole remedy for such delay. Under no circumstances will the Contractor be entitled to an increase in the Contract Sum, or to any other damages, on account of or in connection with any delay, regardless of the cause of such delay, and Contractor agrees not to make any claim for such damages, including, but not limited, claims for damages on account of having to perform out-of-sequence work, claims for damages on account of loss of production, and claims for damages on account of hindrances or interference with the work.

8.3.3 Delete sub-section 8.3.3.

8.3.4 -8.3.5 Add new sections 8.3.4 and 8.3.5 as follows:

> § 8.3.4 No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.
>
> § 8.3.5 The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Architect on account of any delay in the commencement of the Work and/or any

hindrance, delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise, except as and to the extent expressly provided in G.L. c. 30, §39N. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

8.4 Add new section 8.4 as follows:

§ 8.4 LIQUIDATED DAMAGES

§ 8.4.1 It is expressly understood and agreed, by and between the Contractor and Owner, that the time for the completion of the Work described herein is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial and/or residential conditions prevailing in this locality. If the said Contractor shall neglect, fail or refuse to complete the Work within the times herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner $1,500.00, not as a penalty but as liquidated damages for such breach of contract, for each and every calendar day that the Contractor shall be in default after the time stipulated for completing the Work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted by the Owner from periodic payments.

ARTICLE 9 Payments and Completion

9.1.2 Delete subsection 9.1.2 and replace with the following:

§9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that, in the opinion of the Architect, application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner, the applicable unit prices shall be equitably adjusted.

9.2 Add to the end of the section as follows:

, and shall be revised if later found by the Architect to be inaccurate. In addition, the Contractor shall submit to the Architect, at least 14 days before the first Application for Payment, a Cash Flow Schedule that shows the percentage completion to be obtained and the total dollar value of Work to be completed as of the first of each month until Substantial

Completion. All calculations in the Cash Flow Schedule shall be on the basis of Work in place and shall exclude the value of materials delivered but not in place.

9.2.1 Add new sub-section 9.2.1 as follows:

> § 9.2.1 The Cash Flow Schedule shall be based on an orderly progression of the Work allowing adequate time for each operation (including adequate time for submission and review of submittals) and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Cash Flow Schedule will be reviewed by the Architect for compliance with the requirements of the Contract Documents. Unless specifically required by law, no payment under this Contract shall be due until the Cash Flow Schedule has been reviewed and approved by the Architect. The Architect's review of the Cash Flow Schedule shall not impose any duty on the Architect or the Owner with respect to the timing, planning, scheduling or execution of the Work. In particular if the Contractor proposes a Cash Flow Schedule indicating a date of Substantial Completion which is earlier than the Contract Time the Contractor shall not be entitled to additional payment or compensation of any kind if for any reason the full Contract Time is required to achieve Substantial Completion of the Work.

9.3.1.1 Delete sub-section 9.3.1.1.

9.3.2 Add to the end of the sub-section as follows:

> The Owner may deduct the amount of such costs from payments due the Contractor.

9.4.1 Insert at the beginning of the first sentence as follows:

> Subject to the Contractor's compliance with Section 9.3 and the provisions of Section 9.6,

9.5.1 Add new sub-headings .8, .9, .10, .11, and .12 as follows:

> .8 failure of the Contractor or mechanical or electrical trade subcontractors to comply with requirements of the General Requirements for maintaining record drawings. The Contractor shall check record drawings each month. Written confirmation that the record drawings are current will be required by the Architect before approval of the Contractor's monthly payment requisition;
> .9 failure of the Contractor to provide required warranties under Section 9.3, claims for direct payment, or reasonable evidence indicating probable filing of such claims;

.10 costs incurred by the Owner under Section 10.2.5;
.11 failure of the Contractor to submit prerequisite documentation required by the General Requirements; or
.12 liquidated damages due the Owner pursuant to Section 8.4.

9.5.2 Delete "Claim" and replace with "claim".

9.5.3 Delete sub-section 9.5.3.

9.6.4 Delete "If the Contractor fails to furnish such evidence within seven days," from the beginning of the second sentence.

9.6.5 Delete sub-section 9.6.5.

9.6.7 Delete sub-section 9.6.7.

9.6.9 Add new sub-section 9.6.9 as follows:

> § 9.6.8 Notwithstanding the provisions of Section 9.6 all progress payments shall be made in accordance with Chapter 30, Sections 39F, 39G and 39K (as appropriate) of the General Laws of the Commonwealth of Massachusetts, as amended.

9.7 Delete section 9.7.

9.8.1 Add to the end of the sub-section as follows:

> In addition, Substantial Completion for the entire Project shall be achieved only when: (1) the Owner has beneficial occupancy and use of the entire Project for all its intended uses; (2) all Project systems included in the Work are operational and acceptable to the Owner; (3) all governmental inspections for the Project have been successfully completed, all governmental approvals and related paperwork have been delivered to the Owner, and final and unconditional certificates of occupancy for the entire Project have been delivered to the Owner, (4) the only remaining Work to be performed is minor in nature and the remaining Work may reasonably be performed without having a material adverse effect on or materially interfering with the Owner's occupancy and use of the Project and (5) all prerequisites to Substantial Completion defined in the Contract Documents have been completed.

9.8.2 Add to the end of the first sentence as follows:

> together with the estimated value of completing or correcting such items (the "Punchlist") and (2) the permits and certificates referenced in Section

13.5. The Architect shall have the right to modify and supplement the Punchlist, including the estimated value of completion or correction.

9.8.5 Delete sub-section 9.8.5 and replace as follows:

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor by the Architect. The certificate shall state the date of substantial completion, shall state any consequent responsibilities of the Contractor and the Owner in accordance with the Contract Documents. The Contractor shall complete and correct any incomplete and defective work within forty-five (45) calendar days from the date of Substantial Completion

9.8.6 Add new sub-section 9.8.6 as follows:

§ 9.8.6 Services provided by the Architect to conduct more than three (3) inspections of completed Work and any inspections beyond sixty (60) days after the date of substantial completion of any portion of the Work as stated in the Agreement shall be paid by the Contractor to the Owner. The Owner may deduct the cost of such services and inspections from payments due the Contractor.

9.9.1 Delete the end of the first sentence starting after "Work at any stage".

Delete the second sentence and replace as follows:

Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner has accepted in writing the responsibilities assigned to it and the Contractor for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance.

Delete the second to last sentence.

9.10.1 Add to the end of the sub-section as follows:

By Final Completion, the Contractor shall have completed its performance of all Punchlist items, completed all balancing of mechanical and other applicable systems and all seasonal system adjustments that are reasonably necessary to proper functioning of the completed Project, delivered to the Owner all operations and maintenance manuals and completed related training for such manuals, and delivered to the Owner all required warranties and guarantees.

9.10.3 Delete sub-sections 9.10.3 and 9.10.4.
-9.10.4

9.10.5 Insert "for payment for Work performed and of all other claims of which the payee knew or should have known at the time of final payment," after "claims by that payee"

9.10.6 Add new sub-section 9.10.6 as follows:

§ 9.10.6 Notwithstanding anything in the Contract Documents to the contrary, final payment shall be made in accordance with the requirements of G.L.c.30, §39K (building projects) or §39G (public works projects), as amended.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.2.1 Add new sub-heading .4 as follows:

.4 work or property of the Owner, its tenants, or other parties at or near the Project site with the Owner's permission.

10.2.5 At the beginning and end of the first sentence:

Delete "and" after "10.2.1.2".

Insert "and 10.2.1.4" after "10.2.1.3".

Delete the second sentence in its entirety.

10.2.9 -10.2.13 Add new sub-sections 10.2.9, 10.2.10, 10.2.11, 10.2.12, and 10.2.13 as follows:

§ 10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

§ 10.2.10 The Contractor shall at all times protect excavations, trenches, buildings and materials from rain water, groundwater, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

§ 10.2.11 The Contractor shall remove snow and ice which might result in damage or delay.

§ 10.2.12 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, adequate to permit the Work to proceed in a timely fashion, and to prevent damage to completed Work or Work in progress, or to materials stored on the premises. The use of the permanent heating and/or ventilation systems for temporary heat and/or ventilation shall be subject to the prior written approval of the Owner and Architect.

§ 10.2.13 [G.L. c.149, §44F(1)] The Contractor shall install weather protection and furnish adequate heat in the protected area from November 1 to March 31.

10.3.1 Delete the second sentence and replace as follows:

The Contractor shall not cause or permit any introduction onto, under, or near the Owner's property of any hazardous materials or substances as defined by any applicable law, and shall not cause of permit any release, discharge, transportation, storage, or disposal of such materials or substances onto, under, or near the Owner's property or areas near the Owner's property. If the Contractor encounters or recognizes on the site any material known or reasonably believed to be hazardous, including but not limited to asbestos or polychlorinated biphenyl (PCB), the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Contractor and the Owner shall cooperate in implementing measures to remove or contain said material and the Contractor shall comply with all directions of the Architect in the implementation of such removal or containment.

10.3.2 Delete sub-sections 10.3.2, 10.3.3, and 10.3.4.

10.3.5 Delete the remainder of the sentence starting after "obligations under" and replace as follows:

Article 10 or for any violation of applicable law related to the Contractor's noncompliance with the provisions of this Article 10.

10.3.6 Delete sub-section 10.3.6.

10.3.7 Add new sub-section 10.3.7 as follows:

§ 10.3.7 The parties anticipate that certain hazardous substances and/or materials may be discovered at the site. When such conditions are set forth in the Contract Documents, the Contractor acknowledges that such conditions have been considered in establishing the Contract Time and

Contract Sum. No extension of the Contract Time or increase in the Contract Sum shall be claimed or allowed with respect to any hazardous substances or materials located at the site which were disclosed in the Contract Documents. The Contractor shall strictly comply with all laws, regulations, rules, orders, ordinances and the like related to the excavation, storage, removal and disposal of any such hazardous substances or materials.

ARTICLE 11 INSURANCE AND BONDS

11.1.1 In the last sentence insert “the Owner’s Project Manager,” after “The Owner,”.

Add the following new paragraphs to the end of Section 11.1.1:

> The insurance required by this Agreement shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), Owner's and Contractor's Protective, Products and Completed Operations, and Owned, Non-owned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or those set forth in the Contract Documents, whichever is greater.
>
> All insurance shall be written on an occurrence basis, unless the Owner approves in writing coverage on a claims-made basis. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and any further period during which coverage is required to be maintained after final payment by the Contract Documents. The Owner shall be named an Additional Insured on all policies.
>
> Coverage for such liability insurance shall be provided by a company or companies reasonably acceptable to the Owner and authorized to do business in Massachusetts. Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work.

11.1.2 Delete subsection 11.1.2 and replace with the following:

> §11.1.2 Contractor shall provide Performance and Payment Bonds, each in the amount of 100% of the Contract Price, and each by a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and acceptable to the Owner. The attorney-in-fact who signs the bonds on behalf of the surety, must affix to each bond a certified and current copy of the power of attorney. The Performance and Payment Bonds shall be written in a form satisfactory to the Owner.

11.1.5 Add new sub-section 11.1.5:

§ 11.1.5 In no case shall the limits of liability be less than the following:

Contractor's Commercial General Liability

Bodily Injury & Property Damage	$1,000,000.00 each occurrence $2,000,000.00 general aggregate, per project

This policy shall include coverage relating to explosion, collapse, and underground property damage if blasting operations constitute part of the Work to be performed under this Contract.

Vehicle Liability
The Contractor shall provide the following minimum coverage with respect to the operations of any employee, including coverage for owned, non-owned, and hired vehicles:

Combined Single Limit:	$2,000,000.00

Worker's Compensation
The Contractor shall provide the following coverage in accordance with M.G.L. c. 149, sec. 34A and M.G.L. c. 152 as amended, unless a higher coverage is specified below:

Part One	Provide Statutory Minimum
Employer's Liability	$1,000,000.00 each accident
Part Two	$1,000,000.00 disease per employee
	$1,000,000.00 disease policy aggregate

Umbrella Liability Coverage	$5,000,000 All Limits

11.1.3.1 The Contractor shall be responsible for having acceptable insurance coverage provided by or on behalf of all Subcontractors, with such insurance to be similar to that required of the Contractor under the Agreement and these General Conditions. The Contractor shall not allow any Subcontractor to commence Work on the Project prior to the Contractor's receipt of certificates of insurance that are acceptable in form and limits to the Owner; the Owner shall have no obligation to pay the Contractor for any Work performed by a Subcontractor who has not supplied acceptable insurance certificates prior to starting its Work. The Owner shall be named an additional insured on all such certificates.

11.1.3.2 All insurance policies shall contain provisions or endorsements necessary to assure coverage of claims by one insured against another. All required insurance policies are to be endorsed to state that the Contractor's policies shall be primary to all other insurance available to the Owner and other specified additional insureds for liability arising out of or resulting from the Contractor's operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

11.2 Delete section 11.2 and replace as follows:

§ 11.2 OWNER'S LIABILITY INSURANCE
The Contractor shall procure and pay for an Owner's policy of Owner's protective liability insurance insuring the Owner and its officers, employees and agents against claims which may arise from operations under the Contract or relating thereto.

11.2.1 Delete sub-section 11.2.1 and replace as follows:

§ 11.2.1 The Contractor shall purchase and maintain property insurance upon the entire Work at the site to the full insurable value thereof. Coverage for such liability insurance shall be provided by a company or companies reasonably acceptable to the Owner. Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work. Such insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the work and shall insure against the perils of fire and extended coverage and shall include "all risks" insurance for physical loss or damage including without duplication, theft, vandalism and malicious mischief. This insurance shall also cover portions of the Work stored off the site or in transit. If this insurance is written with stipulated amounts deductible, the Owner shall not be responsible for any difference between the payments made by the insurance carrier and the claim. The policy shall contain a provision that coverages afforded under policies will not be canceled or allowed to expire until at least 30 days' written notice has been given to the Owner. The Owner shall be named insured within the policy.

11.2.3 Delete sub-section 11.2.3.

11.3 - Delete Section 11.3 and replace as follows:

Contractor waives all rights against (1) the Owner; (2) the Architect and Architect's consultants; and (3) the Owner's Project Manager and Owner's Project Manager's consultants for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project. The Contractor shall require similar written waivers in favor of the individuals and entities identified above from the Contractor’s subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

11.4 – Delete Section 11.4 in its entirety

11.5.1 Delete the first sentence.

11.5.2 Delete sub-section 11.5.2

11.6.11 Add new sub-section 11.6.1 as follows:

> § 11.6.11 The Owner shall have the power to adjust and settle with its insurers any loss for which it has obtained insurance.
>
> Upon the occurrence of an insured loss, the Owner and the Contractor shall cooperate with each other and with each other's insurer in the submission of claims and related information and the distribution of any insurance proceeds. If after such a loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate change order.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.2.1 Add to the end of the sub-section as follows:

> The Contractor shall bear the cost of any loss or damages to the Owner resulting from such failure or defect.

12.2.2.1 Delete the third sentence.

Add to the end of the sub-section as follows:

> If the correction or repair of any of the Work is required to avoid impacts to the maintenance, operation or safety of any portion of the Project site or the Owner’s property, the Owner reserves the right to undertake the repairs prior to notifying the Contractor or without waiting for the

Contractor to respond, without waiving the Owner's rights under the warranties and the Owner's right to correct work under Section 2.4.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 Delete the words "by the law of", and insert the words "Commonwealth of Massachusetts" at the end of the sentence as revised.

Delete the second sentence.

13.2.1 In the second sentence delete "Except as provided in Section 13.2.2".

13.2.2 Delete sub-section 13.2.2.

13.4.4 Delete sub-section 13.5.4 and replace as follows:

> § 13.5.4 The Contractor shall obtain and deliver promptly to the Architect any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.

13.7.1 Add new sub-section 13.7.1 as follows:

> § 13.7.1 It is expressly agreed that the obligations of the Contractor hereunder arise out of contractual duties, and that the failure of the Contractor to comply with the requirements of the Contract Documents shall constitute a breach of contract, not a tort, for the purpose of applicable statutes of limitation and repose. Any cause of action which the Owner may have on account of such failure shall be deemed to accrue only when the Owner has obtained actual knowledge of such failure, not before.

13.8 Add new section 13.8 as follows:

> § 13.8 LIMITATION OF LIABILITY
>
> § 13.8.1 The Owner shall be liable, if ever, only to the extent of its interest in the Project; and no officer, director, partner, agent or employee of the Owner shall ever be personally or individually liable with respect to this Contract or the Work. Each Subcontract shall include the foregoing limitation, which shall be effective if the Owner ever succeeds to the Contractor's rights and obligations under a Subcontract.

13.9 Add new section 13.9 as follows:

> § 13.9 DEFENSE OF SUITS
>
> § 13.9.1 The Contractor shall be responsible for, shall defend and pay all costs, attorneys' fees and liabilities both direct and indirect as a result of suits arising out of this Contract.
>
> § 13.9.2 Neither final acceptance nor occupation of the premises by the Owner shall relieve the Contractor of responsibility for all claims for labor, materials, and equipment arising out of this Contract.
>
> § 13.9.3 The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses, and expenses including attorneys' fees arising out of or resulting from the performance of the work.

ACTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1.1 Insert in the beginning of the first sentence as follows:

> Provided that the Contractor is not in breach of any of its obligations under the Contract,

Delete sub-headings .1, .2, and .4.

14.1.2 Delete sub-section 14.1.2.

14.1.3 Delete sub-section 14.1.3 and replace as follows:

> § 14.1.3 If one of the above reasons exists, the Contractor may, upon seven days written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work properly executed and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. The payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest.

14.1.4 Delete sub-section 14.1.4.

14.2.1 Delete “repeatedly” from the beginning of sub-headings .1 and .3.

Insert new sub-headings .4 and .5 after sub-heading .3 as follows:

.4 becomes the subject of a voluntary petition in bankruptcy or any voluntary proceeding related to insolvency, receivership, liquidation or comparable proceeding or any assignment for the benefit of creditors or becomes the subject of an involuntary petition in bankruptcy or any involuntary proceeding related to insolvency, receivership, liquidation or comparable proceeding or any assignment for the benefit of creditors.

.5 submits three successive Applications for Payment, each of which indicate that the actual Work completed is less than 90 percent of the values estimated in the construction schedule (submitted by the Contractor pursuant to Section 3.10.1) to be completed by the respective dates.

14.2.2 In the first sentence delete “, and upon certification by the Architect that sufficient cause exists to justify such action,”.

Delete the second sentence of sub-heading .3.

14.2.4 In the first sentence:

Insert “all costs and losses incurred by the Owner on account of the Contractor’s failure to comply with the Contract Documents and” after “the Work, including”.

Insert “and Owner’s Project Manager’s” after “for the Architect’s”.

Delete the last sentence of the sub-section and replace as follows:

The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner’s damages have been established, and to apply such amounts to such damages.

14.3.2 Insert “, subject to compliance with the conditions of Section 8.3.” at the end of the first sentence.

Delete the second sentence.

14.4.2 In sub-heading .3 delete “and” after “all existing contracts” and replace with “except for subcontracts, if any, that Owner elects to assume, terminate all”

14.4.3 Delete sub-section 14.4.3 and replace as follows:

§ 14.4.3 In the event that the Contract is terminated for the Owner’s convenience, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work properly performed up to the termination date, and for all materials or equipment not incorporated in the

Work, but delivered and suitably stored at the site. Payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest. The Contractor shall not be entitled to payment for overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

15.1.1 Delete sub-section 15.1.1 and replace as follows:

> § 15.1.1 DEFINITION
> The word "Claim" shall mean a written demand by the Contractor for an increase in the Contract Time or the Contract Sum. The Contractor is responsible for substantiating its Claims. The word "Claim" shall not include claims by the Owner. The Owner may withhold from the Contractor the value of any claims against the Contractor in accordance with Massachusetts General Laws, including, but not limited to, Sections 39G and 39K of Chapter 30.

15.1.2 Delete subsection 15.1.2

15.1.3 Delete sub-section 15.1.3 and replace as follows:

> § 15.1.3 NOTICE OF CLAIMS
> Contractor must initiate Claims within fourteen (14) calendar days after occurrence of the event giving rise to such Claim by written notice to the Architect and the Owner. Such written notice must (1) be signed by the Contractor; (2) conspicuously identify on its face that the notice serves as a notice of claim; (3) explain in sufficient detail the basis of the Claim; (4) identify the date of the event giving rise to such Claim; and (5) state the exact dollar amount of the increase in the Contract Sum being requested, if any, and the number of days extension to the Contract Time sought, if any.

15.1.3.2 Delete subsection 15.1.3.2

15.1.4 Delete "Section 9.7 and" after "as provided in".

15.1.4.2 Delete subsection 15.1.4.2

15.1.6.1 In the second sentence delete "of cost and" after "include an estimate".

15.1.6.2 Delete sub-section 15.1.5.2.

15.1.7 Delete sub-section 15.1.7.

15.2.1 Delete the capitalized word, “Claim,” and replace with lower-case word, “claim,” in the first and fourth sentences.

In the third sentence:

Delete “mediation” after “condition precedent to” and replace with “litigation”.

15.2.2 Delete sub-section 15.2.2 and replace as follows:

§ 15.2.2 The Initial Decision Maker will review Claims and within 30 days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the Contractor; (2) notify the Contractor that the Initial Decision Maker requires additional time to resolve the Claim; and/or (3) reject the Claim in whole or in part.

15.2.3 Delete the last sentence.

15.2.4 Delete sub-section 15.2.4 and replace as follows:

§ 15.2.4 If the Architect requests the Contractor to furnish additional supporting data in connection with a Claim, the Contractor shall provide such data within ten (10) calendar days of such request. If the Contractor is of the opinion that it is impossible to provide such data within such time, the Contractor shall notify the Architect of such opinion in writing within such ten-day period. If the Architect determines that it is impossible for such data to be provided within such ten-day period through no fault of the Contractor, the Contractor shall provide such data within 30 calendar days of the Architect’s request, unless the Architect fixes another date, in which case the data must be submitted by the date so fixed. Failure of the Contractor to provide such data within the time prescribed herein shall result in the irrevocable waiver of the Claim.

15.2.5 Delete the last sentence and replace as follows:

The rejection of a claim by the Architect and any decisions of the Owner with respect to the same, and the interpretations by the Architect of the plans, drawings and specifications, shall be final and binding on the Contractor in accordance with Section 39J of Chapter 30 of the Massachusetts General Laws.

15.2.6 Delete sub-section 15.2.6 in its entirety.

15.2.7 Delete the capitalized word, “Claim,” and replace with lower-case word, “claim,” in the first and second sentences.

15.2.8 Delete sub-section 15.2.8.

15.3 Delete sections 15.3 and 15.4 in their entirety.
-15.4

SECTION 00 73 73.16

THE COMMONWEALTH OF MASSACHUSETTS

SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

I. Definitions

For purposes of this contract,

“Minority” means a person who meets one or more of the following definitions:

- (a) American Indian or Native American means: all persons having origins in any of the original peoples of North America and who are recognized as an Indian by a tribe or tribal organization.
- (b) Asian means: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands, including, but not limited to China, Japan, Korea, Samoa, India, and the Philippine Islands.
- (c) Black means: All persons having origins in any of the Black racial groups of Africa, including, but not limited to, African-Americans, and all persons having origins in any of the original peoples of the Cape Verdean Islands.
- (d) Eskimo or Aleut means: All persons having origins in any of the peoples of Northern Canada, Greenland, Alaska, and Eastern Siberia.
- (e) Hispanic means: All persons having their origins in any of the Spanish-speaking peoples of Mexico, Puerto Rico, Cuba, Central or South America, or the Caribbean Islands.

“State construction contract” means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility, or a contract for the construction, reconstruction, alteration, remodeling or repair of a public work undertaken by a department, agency, board, or commission of the commonwealth.

“State assisted construction contract” means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility undertaken by a political subdivision of the commonwealth, or two or more political subdivisions thereof, an authority, or other instrumentality and whose costs of the contract are paid for, reimbursed, grant funded, or otherwise supported, in whole or in part, by the commonwealth.

II. Equal Opportunity, Non-Discrimination and Affirmative Action

During the performance of this Contract, the Contractor and all subcontractors (hereinafter collectively referred to as "the Contractor") for a state construction contract or a state assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability, shall not discriminate in the selection or retention of subcontractors, and shall not discriminate in the procurement of materials and rentals of equipment.

The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship or on-the-job training opportunity. The Contractor shall comply with the provisions of chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this Contract.

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B).

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. Such affirmative action measures shall entail positive and aggressive measures to ensure non-discrimination and to promote equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, apprenticeship and on-the-job training programs. A list of positive and aggressive measures shall include, but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority, women and other community-based organizations of employment opportunities; validating all job specifications, selection requirements, and tests; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying the administering agency in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker. These and other affirmative action measures shall include all actions required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. One purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.

III. Minority and Women Workforce Participation

Pursuant to his/her obligations under the preceding section, the Contractor shall strive to achieve on this project the labor participation goals contained herein. Said participation goals shall apply in each job category on this project including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers and those classes of work enumerated in Section 44F of Chapter 149 of the Massachusetts General Laws. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The participation goals, as set forth herein, shall not be construed as quotas or set-asides; rather, such participation goals will be used to measure the progress of the Commonwealth's equal opportunity, non-discrimination and affirmative action program. Additionally, the participation goals contained herein should not be seen or treated as a floor or as a ceiling for the employment of particular individuals or group of individuals.

IV. Liaison Committee

At the discretion of the agency that administers the contract for the construction project there may be established for the life of the contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering the contract for the construction project, hereinafter called the administering agency, a representative from the Office of Affirmative action, and such other representatives as may be designated by the administering agency.

The Contractor (or his/her agent, if any, designated by him/her as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

V. Reports and Records

The Contractor shall prepare projected workforce tables on a quarterly basis when required by the administering agency. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also, when updated, to the administering agency and the Liaison Committee when required.

The Contractor shall prepare weekly reports in a form approved by the administering agency, unless information required is required to be reported electronically by the administering agency, the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority. Copies of these shall be provided at the end of each such week to the administering agency and the Liaison Committee.

Records of employment referral orders, prepared by the Contractor, shall be made available to the administering agency on request.

The Contractor will provide all information and reports required by the administering agency on instructions issued by the administering agency and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the administering agency to effect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary non-discrimination, equal opportunity and access and opportunity contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency and shall set forth what efforts he has made to obtain the information.

VI. Access to Work Site

A designee of the administering agency and a designee of the Liaison Committee shall each have a right to access the work site.

VII. Solicitations for Subcontracts, and for the Procurement of Materials and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and equal opportunity.

VIII. Sanctions

Whenever the administering agency believes the General or Prime Contractor or any subcontractor may not be operating in compliance with the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B), the administering agency may refer the matter to the Massachusetts Commission Against Discrimination (“Commission”) for investigation.

Following the referral of a matter by the administering agency to the Massachusetts Commission Against Discrimination, and while the matter is pending before the MCAD, the administering agency may withhold payments from contractors and subcontractors when it has documentation that the contractor or subcontractor has violated the Fair Employment Practices Law with respect to its activities on the Project, or if the administering agency determines that the contractor has materially failed to comply with its obligations and the requirements of this Section. The amount withheld shall not exceed a withhold of payment to the General or Prime Contractor of 1/100 or 1% of the contract award price or $5,000, whichever sum is greater, or, if a subcontractor is in non-compliance, a withhold by the administering agency from the General Contractor, to be assessed by the General Contractor as a charge against the subcontractor, of 1/100 or 1% of the subcontractor price, or $1,000 whichever sum is greater, for each violation of the applicable law or contract requirements. The total withheld from any one General or Prime Contractor or subcontractor on a Project shall not exceed $20,000 overall. No withhold of payments or investigation by the Commission or its agent shall be initiated without the administering agency providing prior notice to the Contractor.

If, after investigation, the Massachusetts Commission Against Discrimination finds that a General or Prime Contractor or subcontractor, in commission of a state construction contract or state-assisted construction contract, violated the provisions of the Fair Employment Practices Law, the administering agency may convert the amount withheld as set forth above into a permanent sanction, as a permanent deduct from payments to the General or Prime Contractor or subcontractor, which sanction will be in addition to any such sanctions, fines or penalties imposed by the Massachusetts Commission Against Discrimination:

No sanction enumerated under this Section shall be imposed by the administering agency except after notice to the General or Prime Contractor or subcontractor and an adjudicatory proceeding, as that term is used, under Massachusetts General Laws Chapter 30A, has been conducted.

IX. Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

X. Contractor's Certification

A bidder for a state construction contract or state assisted construction contract will not be eligible for award of the contract unless such bidder has submitted to the administering agency the following certification, which will be incorporated into the resulting contract:

CONTRACTOR'S CERTIFICATION

____certifies that they:
(Contractor Name)

1. Will not discriminate in their employment practices;

2. Intend to use the following listed construction trades in the work under the contract

   ____

   ____; and

3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and

4. Are in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and

5. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.

6. Agree to comply with all provisions contained herein.

____
(Signature of authorized representative of Contractor) Date

____
(Printed name of authorized representative of Contractor)

XI. Subcontractor Requirements

Prior to the award of any subcontract for a state construction contract or a state assisted construction contract, regardless of tier, the Prime or General Contractor shall provide all prospective subcontractors with a complete copy of this Section entitled "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" and will incorporate the provisions of this Section by reference into any and all contracts or work orders for all subcontractors providing work on the Project. In order to ensure that the said subcontractor's certification becomes a part of all subcontracts under the prime contract, the Prime or General Contractor shall certify in writing to the administering agency that it has complied with the requirements as set forth in the proceeding paragraph.

ATTACHMENT B

Excerpts from Chapters 30, 82 and 149 of the Massachusetts General Laws

***NOTICE** - These are **NOT** the official versions of the Massachusetts General Laws (MGL). While reasonable efforts have been made to assure the accuracy of the excerpts provided, do not rely on this information without first checking the Official Edition of the MGL. If you are in need of legal advice or counsel, consult a lawyer. These excerpts include amendments to the General Laws passed before November 30, 2023. For laws enacted since that time, see the 2023 Session Laws and the 2024 Session Laws.*

CERTAIN EXCERPTS FROM THE MASSACHUSETTS GENERAL LAWS ARE APPLICABLE TO CONSTRUCTION CONTRACTS. ATTENTION IS DIRECTED TO THE FOLLOWING SECTIONS OF CHAPTER 149 AS AMENDED.

Section 25. LODGING, BOARD AND TRADE OF PUBLIC EMPLOYEES; STATUTE PART OF EMPLOYMENT CONTRACT.

"Every employee in public work shall lodge, board, and trade where and with whom he elects; and no person or his agents or employees under contract with the commonwealth, a county, city or town, or with a department, board, commission or officer acting therefor, for the doing of public work shall directly or indirectly require, as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person. This section shall be made a part of the contract for such employment."

Section 26. PUBLIC WORKS; PREFERENCE TO VETERANS AND CITIZENS; WAGES.

"In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works by the commonwealth, or by a county, town, authority or district, or by persons contracting or subcontracting for such works, preference shall first be given to citizens of the commonwealth who have been residents of the commonwealth for at least six months at the commencement of their employment who are veterans as defined in clause Forty-third of section 7 of chapter 4 and who are qualified to perform the work to which the employment relates and, within such preference, preference shall be given to service-disabled veterans; and secondly, to citizens of the commonwealth generally who have been residents of the commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect..."

Section 34. PUBLIC CONTRACTS; STIPULATION AS TO HOURS AND DAYS OF WORK; VOID CONTRACTS.

"Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working within the commonwealth, in the employ of the contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency, or, in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one day, except as aforesaid..."

Section 34A. CONTRACTS FOR PUBLIC WORKS; WORKERS' COMPENSATION INSURANCE; BREACH OF CONTRACT; ENFORCEMENT AND VIOLATION OF STATUTE.

"Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall, before commencing performance of such contract, provide by insurance for the payment of compensation and the furnishing of other benefits under chapter one hundred and fifty-two to all persons to be employed under the contract, and that the contractor shall continue such insurance in full force and effect during the term of the contract. No officer or agent contracting in behalf of the commonwealth or any political subdivision thereof shall award such a contract until he has been furnished with sufficient proof of compliance with the aforesaid stipulations. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the officer or agent who awarded the contract at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice. Notice of cancellation sent by the party proposing cancellation by registered mail, postage prepaid, with a return receipt of the addressee requested, shall be a sufficient notice..."

Section 34B. CONTRACTS FOR PUBLIC WORKS; WAGES FOR RESERVE POLICE OFFICER.

"Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town."

Whenever general bids are invited for a contract subject to Section 44A, the following provision applies:

Section 44E. FILING OF BIDS; FORMS; MODULAR BUILDINGS. Second paragraph of subdivision (2), clause E.

“The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.”

For projects estimated to cost more than $25,000, the following provision applies to sub-bidders:

Section 44F. PLANS AND SPECIFICATIONS; SUB-BIDS; FORM; CONTENTS. First paragraph of clause I of subdivision (2) of section 44F.

“The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.”

Section 44G. ALLOWANCES; ALTERNATES; WEATHER PROTECTION DEVICES.

“(A) “Allowance” as used herein means a sum of money covering one or more items of labor or labor and materials which is designated in bid documents and which general bidders are required to use in computing their bids. The use of such allowances shall be prohibited in the award of any contract subject to the provisions of section forty-four A. Whenever the designer is unable to supply specifications for any item prior to the solicitation of bids, such item shall not be included in any contract subject to the provisions of section forty-four A. The awarding authority shall solicit bids for every such item separately pursuant to the provisions of section forty-four A after specifications for that item are prepared.

(B) Every alternate contained in the form for general bids shall be listed in a numerical sequence in order of priority. When the awarding authority decides to consider alternates in determining the lowest eligible and responsible bidder, the awarding authority shall consider the alternates in descending numerical sequence, such that no single alternate shall be considered unless every alternate preceding it on the list has been added to or subtracted from the base bid price.

(C) The use of options other than alternates in bid documents or bid forms subject to section forty-four A shall be prohibited under all circumstances.

(D) Every contract subject to section forty-four A shall include specifications for the installation of weather protection and shall require that the contractor shall install the same and that he shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the commissioner or his designee."

Section 44J. INVITATIONS TO BID; NOTICE; CONTENTS; VIOLATIONS; PENALTY.

"(1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefor shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project, and on the COMMBUYS system administered by the operational services division. Said notice shall also be published at such other times and in such other newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specifications of the proposed work may be had; the time and place of submission of general bids; and the time and place for opening of the general bids. For contracts subject to the provisions of section forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids.

Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection.

(5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district of municipal agency.

Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

(9) No request for proposals or invitation for bids issued under sections 38A ½ to 38O, inclusive, of chapter 7, section 11C of chapter 25A, section 39M of chapter 30, this section and sections 44A to 44H, inclusive, shall be advertised if the awarding authority's cost estimate is greater than 1 year old."

Attention is directed to the following sections of Chapter 30 of the General Laws of Massachusetts as amended to date.

Section 38A. PRICE ADJUSTMENT CLAUSE IN CONTRACTS FOR ROAD, BRIDGE, WATER AND SEWER PROJECTS AWARDED UNDER SEC. 39M

"Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent."

Section 39F. CONSTRUCTION CONTRACTS; ASSIGNMENT AND SUBROGATION; SUBCONTRACTOR DEFINED; ENFORCEMENT OF CLAIM FOR DIRECT PAYMENT; DEPOSIT; REDUCTION OF DISPUTED AMOUNTS.

"(1) Every contract awarded pursuant to sections forty-four A to L inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g), and (h).

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to subparagraph (f) of paragraph (1) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) "Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (a) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding

authority as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction.”

Section 39G. COMPLETION OF PUBLIC WORKS; SEMI-FINAL AND FINAL ESTIMATES; PAYMENTS; EXTRA WORK; DISPUTED ITEMS.

"Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one-day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage, if held by the awarding authority, on that work, including the quantity, price and all but one percent retainage, if held by the awarding authority, for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five-days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the awarding authority, on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract."

Section 39I. DEVIATIONS FROM PLANS AND SPECIFICATIONS.

"Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No wilful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section wilfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both."

Section 39J. PUBLIC CONSTRUCTION CONTRACTS; EFFECT OF DECISIONS OF CONTRACTING BODY OR ADMINISTRATIVE BOARD.

"Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law."

Section 39K. PUBLIC BUILDING CONSTRUCTION CONTRACTS; PAYMENTS.

"Every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, shall contain the following paragraph: Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five-days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149."

Section 39L. PUBLIC CONSTRUCTION WORK BY FOREIGN CORPORATIONS; RESTRICTIONS AND REPORTS.

"The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a contract for the work with, and shall not approve as a subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that the corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth."

Section 39M. CONTRACTS FOR CONSTRUCTION AND MATERIALS; MANNER OF AWARDING.

"(b) Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in writing by the awarding authority to anyone making a written request therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said named or described materials."

For projects estimated to cost more than $10,000, the following provision, section 39M subsection c, applies:

"(c) The term "lowest responsible and eligible bidder" shall mean the bidder: (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; (2) who shall certify, that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (3) who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; (4) who, where the provisions of section 8B of chapter 29 apply, shall have been determined to be qualified thereunder; and (5) who obtains within 10 days of the notification of contract award the security by bond required under section 29 of chapter 149; provided that for the purposes of this section the term "security by bond" shall mean the bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority; provided further, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable."

Section 39N. CONSTRUCTION CONTRACTS; EQUITABLE ADJUSTMENT IN CONTRACT PRICE FOR DIFFERING SUBSURFACE OR LATENT PHYSICAL CONDITIONS.

"Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

Section 39O. CONTRACTS FOR CONSTRUCTION AND MATERIALS; SUSPENSION, DELAY OR INTERRUPTION DUE TO ORDER OF AWARDING AUTHORITY; ADJUSTMENT IN CONTRACT PRICE; WRITTEN CLAIM.

"Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim."

Section 39P. CONTRACTS FOR CONSTRUCTION AND MATERIALS; AWARDING AUTHORITY'S DECISIONS ON INTERPRETATION OF SPECIFICATIONS, ETC.; TIME LIMIT; NOTICE.

"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."

Section 39Q. CONTRACTS FOR CAPITAL FACILITY CONSTRUCTION; CONTENTS; ANNUAL CLAIMS REPORT.

"(1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim: the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document."

Section 39R. KEEPING AND MAINTAINING OF BOOKS, RECORDS AND ACCOUNTS; STATEMENT OF MANAGEMENT ON INTERNAL ACCOUNTING CONTROL; FINANCIAL STATEMENTS; ENFORCEMENT.

"(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded

or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) "Audit," when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a *certified* opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) "Management," when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a

letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) if the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary:

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(1) whether the representations of management in response to this paragraph, and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b)."

Section 39S. CONTRACTS FOR CONSTRUCTION; REQUIREMENTS.

“(a) As used in this section the word "person" shall mean any natural person, joint venture, partnership corporation or other business or legal entity. Any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, alteration, remodeling or repair of any public work by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than $10,000, and any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, estimated to cost more than $10,000, shall certify on the bid, or contract, under penalties of perjury, as follows:

(1) That he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

(b) Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

(c) The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection (b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding.”

Section 40. DISCHARGE OR RELEASE OF BONDS.

"Bonds given to the commonwealth, any county, city, town or political subdivision to secure the performance of contracts for the construction or repair of public buildings or other public works may be discharged or released by the awarding authority, upon such terms as it deems expedient, after the expiration of one year from the time of completion, subject to section thirty-nine K, of the work contracted to be done; provided that no claim filed under said bond is pending, and provided further, that no such bonds shall be discharged or released prior to the expiration of all special guarantees provided for in the contract unless new bonds in substitution therefor specifically relating to the unexpired guarantees shall be taken."

ATTENTION IS DIRECTED TO THE FOLLOWING SECTIONS OF CHAPTER 82 (THE LAYING OUT, ALTERATION, RELOCATION AND DISCONTINUANCE OF PUBLIC WAYS, AND SPECIFIC REPAIRS THEREON) OF THE GENERAL LAWS OF MASSACHUSETTS AS AMENDED TO DATE.

Section 40. DEFINITIONS APPLICABLE TO SECTIONS 40A TO 40E.

"The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:

"**Company**", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, municipal traffic signal department, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

"**Description of excavation location**", such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

"**Emergency**", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

"**Excavation**", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures.

"**Excavato**r", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

"Marking standards", the methods by which a company designates its facilities in accordance with standards established by the Common Ground Alliance and the American Public Works Association.

"Non-mechanical means", excavation using any device or tool manipulated by human power, including air vacuum, air blowing or similar methods of excavation designed to minimize direct contact with utilities.

"**Premark**", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Premarking shall not be required of any continuous excavation that is over 500 feet in length.

"Professional land surveyor", a professional land surveyor as defined in section 81D of chapter 112.

"**Safety zone**", a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.

"**Standard color-coded markings**", red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.

"**System**", the underground plant damage prevention system as defined in section 76D of chapter 164."

Section 40A. EXCAVATIONS; NOTICE.

"No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except in an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of Saturdays, Sundays and legal holidays but not more than 30 days before the proposed excavation is to be made, such excavator has premarked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

Any professional land surveyor working on a preliminary design for a new facility or renovation where excavation is necessary shall: (i) Premark the proposed excavation; and (ii) provide initial notice to the system.

The notice requirements shall be waived in an emergency as defined herein; provided, however, that before such excavation begins or during a life-threatening emergency, notification shall be given to the system and the initial point of boring or excavation shall be premarked. The excavator shall ensure that the underground facilities of the utilities in the area of such excavation shall not be damaged or jeopardized.

In no event shall any excavation by blasting take place unless notice thereof, either in the initial notice or a subsequent notice accurately specifying the date and location of such blasting shall have been given and received at least 72 hours in advance, except in the case of an unanticipated obstruction requiring blasting when such notice shall be not less than four hours prior to such blasting. If any such notice cannot be given as aforesaid because of an emergency requiring blasting, it shall be given as soon as may be practicable but before any explosives are discharged."

Section 40B. DESIGNATION OF LOCATION OF UNDERGROUND FACILITIES.

"Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator or professional land surveyor agree, such company shall respond to the initial notice or subsequent notice by designating the location of the underground facilities within 15 feet in any direction of the premarking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall constitute prima facie evidence of an exercise of reasonable precaution by the company as required by this section; provided, however, that in the event that the excavator or professional land surveyor has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonably designate the entire location of its facilities within such 72 hour period, then such excavator or professional land surveyor shall identify for the company that portion of the excavation which is to be first made and the company shall designate the location of its facilities in such portion within 72 hours and shall designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible. A company shall conduct periodic audits to ensure: (i) the accuracy of the designated location and marking of its facilities; and (ii) its adherence to marking standards."

Section 40C. EXCAVATOR'S RESPONSIBILITY TO MAINTAIN DESIGNATION MARKINGS; DAMAGE CAUSED BY EXCAVATOR.

"After a company has designated the location of its facilities at the location in accordance with section 40B, the excavator shall be responsible for maintaining the designation markings at such locations, unless such excavator requests remarking at the location due to the obliteration, destruction or other removal of such markings. The company shall then remark such location within 24 hours following receipt of such request.

When excavating in close proximity to the underground facilities of any company when such facilities are to be exposed, non-mechanical means shall be employed, as necessary, to avoid damage in locating such facility and any further excavation shall be performed employing reasonable precautions to avoid damage to any underground facilities including, but not limited to, any substantial weakening of structural or lateral support of such facilities, penetration or destruction of any pipe, main, wire or conduit or the protective coating thereof, or damage to any pipe, main, wire or conduit.

If any damage to such pipe, main, wire or conduit or its protective coating occurs, the company shall be notified immediately by the excavator responsible for causing such damage.

The making of an excavation without providing the notice required by section 40A with respect to any proposed excavation which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person."

Section 40D. LOCAL LAWS REQUIRING EXCAVATION PERMITS; PUBLIC WAYS.

"Nothing in this section shall affect or impair local ordinances or by-laws requiring a permit to be obtained before excavation in a public way or on private property; but notwithstanding any general or special law, ordinance or by-law to the contrary, to the extent that any permit issued under the provisions of the state building code or state fire code requires excavation by an excavator on a public way or on private property, the permit shall not be valid unless the excavator notifies the system as required pursuant to sections 40 and 40A, before the commencement of the excavation, and has complied with the permitting requirements of chapter 82A."

Section 40E. VIOLATIONS OF SECS. 40A TO 40E; PUNISHMENT.

"Any person or company found by the department of public utilities, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined $1000 for the first offense and not less than $5,000 nor more than $10,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property. The department of public utilities may require any person or company not in compliance with sections 40A to 40E, inclusive, to complete a "Dig Safe" training program in lieu of a fine for a first offense. "

ATTENTION IS DIRECTED TO THE FOLLOWING SECTIONS OF CHAPTER 30 (AN ACT MOBILIZING ECONOMIC RECOVERY IN THE COMMONWEALTH) OF THE ACTS OF 2009.

Section 33.

"(a) Notwithstanding any general or special law to the contrary, the following requirements shall apply to any public works project funded by the American Recovery and Reinvestment Act of 2009 where the amount of construction costs under any contract awarded is likely to exceed $1,000,000. For the purposes of this section, "public works" shall mean building or work the construction of which is carried on by authority of the commonwealth, or by a county, town, authority or district, or with funds of a federal agency or the commonwealth or a county, city, town, authority or district to serve the interest of the general public, regardless of whether title thereof is in the commonwealth or in a county, city, town, authority or district; provided, however, that for the purposes of this definition, "construction" shall have the meaning provided in section 27D of chapter 149 of the General Laws.

(b) For any public works project subject to subsection (a), the specifications set forth in any request for responses shall include a requirement that, on a per project basis, not less than 20 per cent of the total hours of employees receiving an hourly wage who are directly employed on the site of the project, employed by the contractor or a subcontractor and subject to the prevailing wage, shall be performed by apprentices in bona fide apprentice training programs as provided in sections 11H and 11I of chapter 23 of the General Laws which are approved by the division of apprentice training in the executive office of labor and workforce development.

(c) During the performance of a public works project subject to subsections (a) and (b), the contractor shall submit periodic reports to the awarding authority with records indicating the total hours worked by all journeymen and apprentices in positions subject to the apprentice requirement. In any instance in which the apprentice hours do not constitute 5 per cent of the total hours of employees subject to the apprentice requirement, the contractor shall submit a plan to the awarding authority describing how the contractor shall comply with the apprentice requirement.

(d) The attorney general shall have all the necessary powers to require compliance with the requirements of subsections (a), (b) and (c) therewith, including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts. Prior to award of the contract, an awarding authority may petition the attorney general for approval to adjust the requirements set forth in said subsections (a), (b) and (c). The attorney general may adjust these requirements only if he determines that compliance with these requirements is not feasible or if application of the requirements would be preempted by federal law.

(e) An awarding authority serving a low-income population may require additional specifications that address the needs of its clients including, but not limited to, preferential hiring for residents of public housing authorities for available apprenticeship positions.

(f) Subject to appropriation, the division of apprentice training shall enhance its outreach efforts to underserved populations in order to increase and diversify the number of apprentices in the commonwealth."

Section 39.

“Any entity located in the commonwealth that receives federal funds through the American Recovery and Reinvestment Act of 2009 shall provide information as directed by the secretary of administration and finance regarding the use of the funds. The required information shall include, but not be limited to, the reporting information required by the federal government and any other information deemed necessary by the secretary to administer the American Recovery and Reinvestment Act of 2009 responsibly, efficiently and transparently. To the extent possible, the secretary shall work to streamline the reporting of this information, minimize duplication of data entry by recipients and ensure data consistency. The secretary may issue regulations to effectuate this reporting requirement.”

Section 40.

“Employers and hiring agents on all projects funded in whole or in part by the American Recovery and Reinvestment Act of 2009 shall post notices of available employment opportunities to the commonwealth’s job bank or the one-stop career centers closest to where the projects shall be located. The postings shall contain such information as directed by the secretary of labor and workforce development. The secretary may issue regulations to effectuate this job posting requirement.”

END OF SECTION

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SECTION 01 12 16 - SCOPE AND SEQUENCE OF WORK

PART 1 – GENERAL

1.1 WORK INCLUDED:

A. The scope of work includes the following:

A fabric membrane tension salt structure with concrete retaining walls, a separate above ground tank fuel island and all associated site work and utilities.

1.2 RELATED WORK:

A. SECTION 01 11 00 – CONTROL OF WORK AND MATERIALS

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 GENERAL:

A. The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the contract. Scheduling of the work shall be coordinated with the Owner and Engineer.

B. The Construction Sequence Requirements shall be used by the Contractor to form a complete schedule for the project, which shall be coordinated with the Owner and Engineer. Prior to performing any work at the site, the Contractor shall submit a detailed plan to the Engineer for review. The plan shall describe the proposed sequence, methods, and timing of the work.

END OF SECTION

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SECTION 01 14 00 - SPECIAL PROVISIONS

PART 1 - GENERAL

Not used

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 WATER FOR CONSTRUCTION PURPOSES:

A. In locations where water is in sufficient supply, the Contractor may use a construction meter with the written permission of Abington-Rockland Joint Water Works for construction purposes. The express approval of the Owner shall be obtained before water is used. The water will be paid for by the Contractor.

B. If no water is available, the Contractor shall supply water at no additional cost to the Owner.

3.2 PIPE LOCATION:

Pipe shall be located substantially as indicated on drawings. The Owner reserves the right, acting through the Engineer, to make such modifications as may be deemed desirable to avoid interference with existing structures or for other reasons.

3.3 DIMENSIONS OF EXISTING STRUCTURES:

Where the dimensions and locations of existing structures are of critical importance in the installation or connections of new work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment that is dependent on the correctness of such information.

3.4 OCCUPYING PRIVATE PROPERTY:

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the public highways or Owner’s easements, except with the written consent of the property owner or property owner’s agent.

3.5 EXISTING UTILITY LOCATIONS – CONTRACTOR’S RESPONSIBILITY:

A. The location of existing underground services and utilities shown on the drawings is based on available records. It is not warranted that all existing utilities and services are shown, or that shown locations are correct. The Contractor shall be responsible for having the utility companies locate their respective utilities on the ground prior to excavating.

B. To satisfy the requirements of **Massachusetts law, Chapter 82, Section 40**, the Contractor shall, at least 72 hours, exclusive of Saturdays, Sundays and holidays, prior to excavation in the proximity of telephone, gas, cable television and electric utilities, notify the utilities concerned by calling “DIG SAFE” at telephone number: 1-888-344-7233.

C. The Contractor shall coordinate all work involving utilities and shall satisfy itself as to the existing conditions of the areas in which it is to perform his work. It shall conduct and arrange its work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.

3.6 COORDINATION OF WORK:

The General Contractor shall be responsible for coordinating its own work as well as that of any subcontractors. It shall be responsible for notification of the Engineer when each phase of work is expected to begin and the approximate completion date.

3.7 TIME FOR COMPLETION OF CONTRACT:

The time for completion of this contract is stipulated in the Form of/for General Bid. The Bidder shall base his bid on completing the proposed work by the completion date stipulated in Section 00 14 13, FORM OF/FOR GENERAL BID.

3.8 MAINTENANCE OF TRENCH SURFACE:

After backfilling and compacting the trench, the Contractor shall be responsible for keeping the ground surface dry and passable at all times until the surface has been restored to original conditions.

3.9 DESIGN OF EQUIPMENT:

Attention is directed to the fact that the layout of certain equipment is based on that of one manufacturer. If other equipment is submitted for approval, the Contractor shall prepare and submit for approval at its expense, detailed structural, mechanical and electrical drawings, equipment lists, maintenance requirements, and any other data required by the Engineer, showing all necessary changes and embodying all special features of the equipment he proposes to furnish. Such changes, if approved, shall be made at the expense of the Contractor.

3.10 SERVICES OF MANUFACTURER'S REPRESENTATIVE:

A. The Contractor shall arrange for a qualified service representative, at a time suitable to the Engineer, from the company manufacturing or supplying certain equipment as indicated on the detailed specifications, to perform the duties described herein.

B. After installation of the listed equipment has been completed and the equipment is presumably ready for operation, but before others operate it the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:

1. Soundness (without cracks or otherwise damaged parts); completeness in all details, as specified; correctness in setting, alignment, and relative arrangement of various parts; adequacy and correctness of packing, sealing and lubricants.

2. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified. Where called for in the specifications, vibration readings shall be made and the equipment balanced accordingly.

3. On completion of its work, the Contractor shall submit in triplicate to the Engineer the manufacturer's or supplier representative's complete signed report of the results of its inspection, operation, adjustments, and test. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report shall also include a certificate that the equipment conforms to the requirements of the contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4. After the Engineer has reviewed the reports from the manufacturer's representative, the Contractor shall make arrangements to have the manufacturer's representative present when the field acceptance tests are made.

3.11 PROJECT SIGN:

A. **The project sign shall be as shown on the drawing immediately following this section of the specifications.** The sign shall be erected within ten (10) days after the construction contract is awarded. The sign shall be fabricated, erected, and maintained by the Contractor.

B. The Contractor shall provide adequate support for the sign as determined by the Engineer. All supports, trim, and back of sign shall be painted with at least two coats of exterior paint.

C. The project sign shall be maintained by the Contractor in good condition at all times for the duration of construction. The Contractor shall remove the sign upon completion of construction.

3.12 COMPLIANCE WITH PERMITS:

A. The Contractor shall perform all work in conformance with requirements of the Permits, which appear in Section 00 31 43 – PERMITS.

3.13 CUTTING, FITTING AND PATCHING:

A. The Contractor shall do all cutting, fitting, or patching of its work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Contractors, as shown upon or reasonably implied by the drawings and the specifications for the completed structure, including all existing work.

B. The Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of any other Contractor, save with the consent of the Engineer.

C. All holes or openings required to be made in new or existing work, particularly at pipe, conduit, or other penetrations not covered by escutcheons or plates shall be neatly patched. All such holes shall be made completely watertight as approved by the Engineer.

D. Size and locations of holes required in steel, concrete, or other structural or finish materials for piping, wiring, ducts, etc., which have not been located and detailed on the drawings shall be approved by the Engineer prior to layout and cutting thereof. All holes shall be suitably reinforced as required by the Engineer.

E. Workmanship and materials of patching and repair work shall match the adjacent similar work and shall conform to the applicable sections of the specification. Patches and joints with existing work shall provide, as applicable in each case, visual, structural, and waterproofing continuity.

3.14 CONNECTIONS TO EXISTING WATER SYSTEMS:

A. The Owner will, upon **72-hour** notice from the Contractor, assist the Contractor by locating and opening or closing any and all valves required for draining or admitting water to the various sections of the water main as required to perform the proposed work. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.

B. Connections to the existing distribution system shall be made with the mains under pressure unless the lines can be temporarily taken out of service as approved by the Owner.

C. The Contractor will be required to make test excavations to ascertain that the proposed position of the connections will be clear of joints, fittings, or other obstructions.

D. If any failure occurs in connection to existing mains, service shall be restored in the shortest possible time, the Contractor working around the clock, if necessary. The Contractor shall cooperate with the Owner in notifying the consumers or supplying emergency water. If required by Owner, the Contractor shall make connections to water mains during night hours, on Sunday or at other times of off-peak demand for water.

3.15 CONTRACTOR'S REPRESENTATIVE:

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

3.16 VISUAL RECORDING:

Before beginning construction, the Contractor shall make a color DVD recording along the entire work length. One complete recording, for the entire project length, shall be furnished to the Engineer prior to the start of the work. The visual recording shall be identified by street name, as applicable, and station.

3.17 OPERATOR TRAINING:

A trained representative of the manufacturer of all equipment shall instruct the plant operating personnel on the operation and maintenance of the equipment. The Owner reserves the right to videotape all training sessions.

3.18 HOURS OF CONSTRUCTION ACTIVITY:

A. The Contractor shall conduct all construction activity between 7:00 a.m. and 5:00 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.

B. The Owner will provide personnel for assistance in locating and operating valves at no cost to the Contractor during the Owner's normal working hours **(Monday through Friday 7:00 a.m. to 3:00 p.m.**). When this assistance is required by the Contractor outside of the Owner's normal working hours the cost will be incurred by the Contractor at the prevailing overtime rate of pay for the personnel providing the assistance. The Owner will bill the Contractor directly.

3.19 CONSTRUCTION CREWS:

The Contractor shall not increase the number of construction crews assigned to the work without providing one-week advance notice to the Engineer.

3.20 EXTENSION OF UTILITIES TO SITE:

The Owner will directly pay the cost of extending electric to the site and/ or from the adjacent Police Station.. Contractor shall be fully responsible for coordinating the work with the individual utilities.

3.21 MASSACHUSETTS DATA SECURITY REGULATIONS:

The Contractor is required to comply with data security regulations contained in 201 CMR 17.00 that have been established to safeguard personal information of Massachusetts residents contained in paper or electronic records. The Contractor shall not submit to the Engineer or Owner documents in paper or electronic form that contain personal information (person's name combined with one or more of the following – Social Security Number, driver's license number or state-issued identification card number, financial institution account number, or credit or debit card number). Any document submitted to the Engineer that violates this provision shall be returned to the Contractor and the Contractor shall remove personal information from the document prior to resubmitting it to the Engineer. The Contractor shall require each Subcontractor to also comply with the MA data security regulations insofar as they involve submittal of personal information to the Engineer and Owner.

3.22 WINTER WORK:

The Contractor will be required to backfill all excavations at the end of each work day, or place Jersey barriers around open excavations.

The Owner has agreed to provide snow removal services on all public ways affected by this Project. The Owner will not remove snow from the Contractor's work area that the public will not be using for either driving or pedestrian activity.

The Contractor will provide snow removal services on any public way affected by his work that has been authorized by the Owner to be closed to through traffic. Snow will be plowed in accordance with the Owner's normal plowing schedule for the closed public ways.

In no event will the Owner remove snow on any private way affected by the

Contractor's work on this Project. The Contractor may coordinate snow removal activities with whoever provides these services for the owners of the private way(s).

3.23 GENERAL

A. In the event of conflicts or discrepancies among the Contract Documents, the Engineer and Owner shall interpret them. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Engineer's interpretation.

B. or discrepancies among the Contract Documents, the Engineer and Owner shall interpret them. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Engineer's interpretation.

C. ong the Contract Documents, the Engineer and Owner shall interpret them. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Engineer's interpretation.

D. Dimensions shall be figures rather than determined by scale or rule.

E. The Electrical drawings are diagrammatic only, and not intended to show the exact physical locations or configurations of work. Such work shall be installed to clear all obstructions, permit proper clearances for the work of other trades, permit proper clearance for Owner operations within the existing space, and present an orderly appearance where exposed while maintaining existing clearance envelopes based on existing installed systems. All work shall be =

F. Staging, scaffolding, hoisting, and material handling shall be provided by the Contractor or Subcontractor performing the work.

3.26 ALTERNATE PRODUCTS

A. where a product is listed to establish a standard of quality, design and function for the purpose of establishing a basis of design, alternate manufacturers and products will be allowed that meet the basis of design as determined by the Engineer.

3.27 SCHEDULE

A. The Contractor shall prepare a schedule in accordance with the requirements of Specification. The schedule shall reflect a completion date consistent with the duration of the project as identified on the Form for General Bid. A construction schedule with an early completion date may be prepared and utilized by the Contractor as a tool to complete the work early but shall not be accepted as the official project schedule. Failure of the Contractor to complete the work by any early completion date established by the Contractor shall not be cause for filing a delay claim.

END OF SECTION

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SECTION 01 14 19.16 - DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This Section specifies requirements for controlling dust generated during work of this Contract. Work activities requiring special attention to dust control include building demolition, stockpiling, compacting of debris, loading and removal of demolition debris and soil from the site, and earthwork.

B. The Contractor is responsible for control of dust at all times during work of this Contract, 24 hours per day, 7 days per week, including non-working hours, weekends, and holidays.

1.2 RELATED WORK:

A. Section 00 31 43 - PERMITS

B. Section 01 57 19 – ENVIRONMENTAL PROTECTION

C. Section 02 41 16 –DEMOLITION

D. Section 31 00 00 – EARTHWORK

1.3 REGULATORY REQUIREMENTS:

A. The Contractor shall perform all work specified under this Section in compliance with the Massachusetts Department of Environmental Protection, Code of Massachusetts Regulations (CMR) 310 CMR 7.00, “Air Pollution Control Regulations”, specifically 310 CMR 7.09, “Dust, Odor, Construction and Demolition”.

B. Work of this Contract shall be conducted in a manner that will not result in excessive particulate matter emissions, nuisance dust conditions, PM10 (particulate matter with an aerodynamic diameter less than or equal to 10 microns) emissions, or PM10 concentrations exceeding the Massachusetts and National Ambient Air Quality Standard of 150 ug/m3 on 24-hour average basis.

1.4 SUBMITTALS:

A. Contractor shall submit a Dust Control Plan that outlines in detail the measures that it will implement to comply with this Section, including suppression, wind screens and barriers, prevention, cleanup, and other measures. Plan shall be submitted to the Engineer for review and approval within fifteen calendar days following the date of the Notice to Proceed.

B. Contractor shall submit to the Engineer product literature and Material Safety Data Sheets for any dust suppression wetting agents and stabilizers that the Contractor proposes to use.

PART 2 - PRODUCTS

2.1 DUST SUPPRESSION AGENTS:

A. Dust suppression wetting agents shall be water soluble, non-toxic, non-reactive, non-volatile, and non foaming.

B. Soil stabilizer shall be a sprayable organic or inorganic tackifier.

2.2 BARRIERS, SCREENS, AND COVERS:

A. Wind screens shall be a durable fabric mesh of 50 percent porosity, attached to demolition site fence.

B. Wind barriers shall be solid wood fences, solid durable fabric attached to temporary site fence, or other solid barriers intended to block the passage of wind.

C. Covers for stockpiles shall be plastic tarps. Contaminated soil covers shall be 10-mil. polyethylene sheeting or 10-mil. nylon reinforced polyethylene sheeting. The stockpile shall be placed on 20 mil. reinforced polyethylene or 40-mil. sheeting.

2.3 CALCIUM CHLORIDE:

A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

B. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

2.4 WATER:

A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.1 CONSTRUCTION SITE DUST CONTROL – GENERAL:

A. Wet suppression shall be used to provide temporary control of dust. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Contractor shall apply wet suppression on a routine basis as necessary or required by the Engineer, to control dust. At a minimum, wet suppression shall be applied to demolition debris, excavated material, aggregate piles, and exposed soils and dirt.

1. Wet suppression consists of the application of water or a wetting agent in solution with water. Ensure wetting agent is not used on plantable soils.

2. Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks, or other devices capable of providing regulated flow, uniform spray, and positive shut-off.

3. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

4. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

5. The Contractor shall provide the necessary means to retain on-site all water runoff generated by dust control and dispose of such water in accordance with the requirements of the appropriate regulatory agencies. The Contractor shall be responsible for providing water, a means of disposal, necessary permits, and all appurtenances required to control dust. Coordinate with the requirements of Section 01 57 19 - ENVIRONMENTAL PROTECTION.

B. Calcium chloride shall be used to control dust instead of wet suppression when freezing conditions exist. Calcium chloride shall be uniformly applied by a mechanical spreader at 1 ½ pounds per square yard, unless otherwise required by the Engineer. Ensure vegetation or soil to be used for vegetation is not treated.

C. The use of petroleum products for dust suppression is prohibited in this Contract.

D. Provide wind screens and wind barriers in locations where they would be effective in minimizing wind erosion and spread of dust. Locations shall be submitted as part of the Contractor's Dust Control Plan. The Contractor shall keep wind screens and barriers in good repair for the life of the Contract.

E. The Contractor is responsible for daily clean-up of paved areas affected by the work of this Contract. A wet spray power vacuum street sweeper shall be used on paved areas. Dry power sweeping is prohibited.

3.2 PUBLIC ROADWAY DUST CONTROL:

A. Vehicles leaving the demolition site shall have no mud and dirt on the vehicle body or wheels. Any foreign matter on the vehicle body or wheels shall be physically removed prior to vehicle's entering of a public roadway. Contractor shall not permit any truck to leave the site with exterior mud or dirt that has the potential to be deposited on public roadways.

B. Haul truck cargo areas shall be securely and completely covered during material transport on public roadways.

C. Vehicle mud and dirt carryout, material spills, and soil wash-out onto public roadways and walkways and other paved areas shall be cleaned up immediately.

D. The Contractor is responsible for daily clean-up of public roadways and walkways affected by work of this Contract. A wet spray power vacuum street sweeper shall be used on paved roadway. Dry power sweeping is prohibited.

3.3 CONTROL OF EARTHWORK DUST:

A. During batch drop operations (i.e., earthwork with front-end loader, clamshell bucket, or backhoe) the free drop height of excavated or aggregate material shall be reduced as much as practical to minimize the generation of dust.

B. To prevent spills during transport, freeboard space shall be maintained between the material load and the top of the truck cargo bed rail.

3.4 CONTROL OF STOCKPILE DUST:

A. The Contractor shall use the following methods to control dust and wind erosion of active and inactive stockpiles:

1. Wet suppression without wetting agent during active stockpile load-in, load-out, and maintenance activities.

2. Soil stabilizers applied to the surface of inactive stockpiles.

3. Polyethylene tarps on stockpiles shall be placed both below and on top of stockpiles and secured with sandbags or an equivalent method to prevent the cover from being dislodged by the wind. The Contractor shall repair or replace covers whenever damaged or dislodged, at no additional cost to the Owner.

4. The tarps shall be bermed 12-inches high at all edges to prevent any infiltration of storm water or exfiltration of leachate.

B. The methods to be used shall be submitted to the Engineer as part of the Dust Control Plan.

3.5 DEMOLITION DUST CONTROL MEASURES:

A. The Contractor shall use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in the air to the lowest practical level. Sufficient water shall be supplied for the building, demolition-related debris, and site compacting to meet Federal, State, and local air-quality regulations and to minimize dust during demolition.

B. Closed chutes shall be used for the handling of debris. Dropping or throwing of debris is prohibited.

C. Debris shall not be stockpiled. Debris shall be removed promptly from the site.

D. During transport of debris, the truck cargo area shall be securely covered.

END OF SECTION

SECTION 01 22 00 - MEASUREMENT AND PAYMENT

1.1 General

A. The following sections describe the measurement and payment for the work to be done under the respective items listed in the FORM FOR GENERAL BID.

B. The lump sum price stated in the FORM FOR GENERAL BID shall constitute full compensation as herein specified, for all of the work completed in accordance with the drawings and specifications. All other activities required in connection with performance of the work, including all work required under Division 1, GENERAL REQUIREMENTS, whether described in the contract documents or mandated by applicable codes, permits and laws, will not be separately paid for unless specifically provided for in the form for general bid, but will be considered to be incidental to performance of the overall project.

1.2 Item 1

The lump sum price for Item 1 shall constitute full compensation for furnishing all labor, materials, tools and equipment and constructing the project, complete, except for the items included in sub-bids under Item 2, as shown on the drawings and called for in the specifications.

1.3 Item 2 Sub-bids

The lump sum prices for the subdivisions of Item 2 shall constitute full compensation for furnishing all labor, materials, tools, and equipment and performing all work indicated on the drawings and specified for the respective subtrades listed under the subdivisions of Item 2.

1.4 Item 3(a): Transportation Disposal of Group A Material

A. The quantity of Group A material (as defined in Section 02 61 00.16 - Handling, Transportation, Reuse and/or Off-Site Disposal of Excavated Material) for offsite reuse/recycling or offsite disposal to be paid for under this Item 3(a) shall be the number of tons of Group A material transported and reused/recycled.

B. This Item 3(a) constitutes full compensation to provide removal of Group A material, as described in Section 02 61 00.16 and required by the Contract Documents including, but not limited to; furnishing all labor, material, tools, and equipment required to characterize, load, and legally haul Group A material for offsite reuse/recycling or offsite disposal.

1.5 Item 3(b): Transportation and Reuse of Group B Material

A. The quantity of Group B material (as defined in Section 02 61 00.16 – Handling, Transportation, Reuse and/or Off-Site Disposal of Excavated Material) for removal and off-site reuse/recycling to be paid for under this Item 3(b) shall be the number of tons of Group B material transported and reused/recycled.

B. This Item 3(b) constitutes full compensation to provide removal of Group B material, complete, as described in Section 02 61 00.16, and required by the Contract Documents including, but not limited to; furnishing all labor, material, tools, and equipment required to characterize, load, and legally haul Group B material for offsite reuse/recycling.

END OF SECTION

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form acceptable to Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

   a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.

b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 01 31 00 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 through web-based Project management software.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect] are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms provided by Owner. Sample copies are included in Project Manual

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use acceptable to Architect

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 WORK CHANGE DIRECTIVE

A. Work Change Directive: Architect may issue a Work Change Directive on EJCDC Document C-940 Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

    1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

    1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 29 00 PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment

requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 01 10 00 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

   a. Project name and location.
   b. Owner's name.
   c. Owner's Project number.
   d. Name of Architect.
   e. Architect's Project number.
   f. Contractor's name and address.
   g. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

   a. Related Specification Section or division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

      1) Labor.
      2) Materials.
      3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site.

6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.

8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.

B. Payment Application Times: Submit Application for Payment to Architect by the end of the month. The period covered by each Application for Payment is one month, ending on the last day of the month. Pencil Requisition to be reviewed prior to final payment requisition being submitted.

   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

   1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:

      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.

   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
   5. Products list (preliminary if not final).

6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

    a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 77 00 "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. RFIs.
3. Digital project management procedures.
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 12:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly to Owner / Architect.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Architect's Data Files Not Available: Architect will not provide Architect's BIM model digital data files for Contractor's use during construction.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

  1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

  1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of the Contract Documents.
    m. Submittal procedures.
    n. Sustainable design requirements.
    o. Preparation of Record Documents.
    p. Use of the premises and existing building.
    q. Work restrictions.
    r. Working hours.
    s. Owner's occupancy requirements.
    t. Responsibility for temporary facilities and controls.
    u. Procedures for moisture and mold control.
    v. Procedures for disruptions and shutdowns.
    w. Construction waste management and recycling.
    x. Parking availability.
    y. Office, work, and storage areas.
    z. Equipment deliveries and priorities.

        aa. First aid.
        bb. Security.
        cc. Progress cleaning.

    3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

    1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
    2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

        a. Contract Documents.
        b. Options.
        c. Related RFIs.
        d. Related Change Orders.
        e. Purchases.
        f. Deliveries.
        g. Submittals.
        h. Possible conflicts.
        i. Compatibility requirements.
        j. Time schedules.
        k. Weather limitations.
        l. Manufacturer's written instructions.
        m. Warranty requirements.
        n. Compatibility of materials.
        o. Acceptability of substrates.
        p. Temporary facilities and controls.
        q. Space and access limitations.
        r. Regulations of authorities having jurisdiction.
        s. Testing and inspecting requirements.
        t. Installation procedures.
        u. Required performance results.
        v. Protection of adjacent work.
        w. Protection of construction and personnel.

    3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
    4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
    5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

   a. Preparation of Record Documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Procedures for completing and archiving web-based Project software site data files.
   d. Submittal of written warranties.
   e. Requirements for completing sustainable design documentation.
   f. Requirements for preparing operations and maintenance data.
   g. Requirements for delivery of material samples, attic stock, and spare parts.
   h. Requirements for demonstration and training.
   i. Preparation of Contractor's punch list.
   j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   k. Submittal procedures.
   l. Owner's partial occupancy requirements.
   m. Installation of Owner's furniture, fixtures, and equipment.
   n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Status of sustainable design documentation.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site use.
        9) Temporary facilities and controls.
        10) Progress cleaning.
        11) Quality and work standards.
        12) Status of correction of deficient items.
        13) Field observations.
        14) Status of RFIs.
        15) Status of Proposal Requests.
        16) Pending changes.
        17) Status of Change Orders.
        18) Pending claims and disputes.
        19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

B. Related Requirements:

1. Section 01 40 00 "Quality Requirements" for schedule of tests and inspections.
2. Section 01 29 00 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF file.

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.

3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at monthly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Unusual Event Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

   1. Use Microsoft Project, Primavera, or Meridian Prolog for current Windows operating system.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

   1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
   2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for Notice to Proceed to date of Substantial Completion.

   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

   1. Activity Duration: Define activities so no activity is longer than 20, unless specifically allowed by Architect.
   2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

      a. Securing of approvals and permits required for performance of the Work.
      b. Temporary facilities.
      c. Construction of mock-ups, prototypes and samples.
      d. Owner interfaces and furnishing of items.
      e. Interfaces with Separate Contracts.
      f. Regulatory agency approvals.
      g. Punch list.

   3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

- Electrical Items
- HVAC Items
- Pre-Engineered Metal Building
- Door Hardware
- Storefront
- Window Assemblies
- Salt Shed

4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
6. Commissioning Time: Include no fewer than 15 days for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use-of-premises restrictions.
   f. Provisions for future construction.
   g. Seasonal variations.
   h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   a. Subcontract awards.
   b. Submittals.
   c. Purchases.

- d. Mockups.
- e. Fabrication.
- f. Sample testing.
- g. Deliveries.
- h. Installation.
- i. Tests and inspections.
- j. Adjusting.
- k. Curing.
- l. Building flush-out.
- m. Startup and placement into final use and operation.
- n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    - a. Structural completion.
    - b. Temporary enclosure and space conditioning.
    - c. Permanent space enclosure.
    - d. Completion of mechanical installation.
    - e. Completion of electrical installation.
    - f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion, and the following interim milestones:

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At [monthly] <Insert time> intervals, update schedule to reflect actual construction progress and activities. Issue schedule [one week] <Insert time> before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. Distribution: Distribute copies of approved schedule to Architect, Owner’s Project Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.8 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.10 CPM SCHEDULE REQUIREMENTS

A. Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and inspection.
    j. Commissioning.
    k. Punch list and Final Completion.
    l. Activities occurring following Final Completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents,and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts [one week] <Insert time> before each regularly scheduled progress meeting.

1.11 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At bi-weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.

B. Related Requirements:

1. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 02 41 19 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos thumb-drive or by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag or in web-based Project management software site:
    a. Name of Project.
    b. Name and contact information for photographer.
    c. Name of Architect.
    d. Name of Contractor.
    e. Date photograph was taken.
    f. Description of location, vantage point, and direction.
    g. Unique sequential identifier keyed to accompanying key plan.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time and GPS location data from camera.

D. File Names: Name media files with date and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 250 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Waterproofing and weather-resistant barriers.

E. Periodic Construction Photographs: Take 50 photographs daily. Select vantage points to show status of construction and progress since last photographs were taken.

F. Drone Photographs: Take drone photographs monthly at the same vantage point. Drone must comply with all laws and regulations prior to flying.

G. Final Completion Construction Photographs: Take 100 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

H. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:
    a. Special events planned at Project site.
    b. Immediate follow-up when on-site events result in construction damage or losses.
    c. Photographs shall be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
    d. Substantial Completion of a major phase or component of the Work.
    e. Extra record photographs at time of final acceptance.
    f. Owner's request for special publicity photographs.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 32 33 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
4. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Owner’s Project Manager responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Owner’s Project Manager responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Owner’s Project Manager and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's and Owner’s Project Manager's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.

7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Owner’s Project Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Prepare submittals as PDF files and submit to Design & OPM Team via email.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Prepare submittals in PDF form, and email to Design & OPM team.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect and Owner’s Project Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

    a. Reactions & Salt Shed

    b. Fuel Island

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Owner’s Project Manager, through Architect, before being returned to Contractor.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Owner’s Project Manager

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's and Owner’s Project Manager's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Owner’s Project Manager stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    a. Project name and submittal number.
    b. Generic description of Sample.

c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Owner's Project Manager, will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect and Owner's Project Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.

3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on

evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

    1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Owner’s Project Manager.

B. Contractor's Approval: Indicate Contractor's approval for each submittal. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

    1. Architect and Owner’s Project Manager will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S AND OWNER’S PROJECT MANAGER'S REVIEW

A. Action Submittals: Architect and Owner’s Project Manager will review each submittal, indicate corrections or revisions required, and return.

    1. Architect and OPM will indicate, on submittal via return email, the appropriate action.

        a. Actions taken by indication have the following meanings:

B. Informational Submittals: Architect and Owner’s Project Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Owner’s Project Manager will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Owner’s Project Manager.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect Owner’s Project Manager will discard submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

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SECTION 01 35 29 - HEALTH AND SAFETY PLAN

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Prior to the start of work on the site, Contractor shall prepare and submit a site-specific health and safety plan that includes consideration of all known and potential hazards at the site. Work may not proceed at the project site until the Contractor's health and safety plan has been received by the Engineer.

1.2 REFERENCES:

A. OSHA 29 CFR 1910.120

1.3 RELATED WORK:

A. Division 2 specifications

PART 2 – PRODUCTS

2.1 HEALTH AND SAFETY PLAN:

A. The health and safety plan shall include, but not necessarily be limited to the following:

1. Identification of Contractor's Site Safety Officer.
2. Identification of Hazards and Risks Associated with Project.
3. Contractor's Standard Operating Procedures, Including Personnel Training and Field Orientation.
4. Respiratory Protection Training Requirements.
5. Levels of Protection and Selection of Equipment Procedures.
6. Type of Medical Surveillance Program.
7. Personal Hygiene Requirements and Guidelines.
8. Zone Delineation of the Project Site.
9. Site Security and Entry Control Procedures.

10. Field Monitoring of Site Contaminants.

11. Contingency and Emergency Procedures.

12. Listing of Emergency Contacts.

B. The Contractor shall be responsible for adhering to COVID-19 guidelines and procedures for all construction sites and workers at all public work in accordance with the latest guidelines and procedures in effect at the time of bidding of the project. All costs associated with these requirements shall be included in the Contractor's bid price. These costs shall be broken out separately on the contractor's schedule of values accordingly.

PART 3 - EXECUTION

3.1 PERSONAL PROTECTIVE EQUIPMENT:

A. The personal protective equipment required to provide the appropriate level of dermal and respiratory protection shall be determined based on the results of continuous air monitoring performed by the Contractor and the standards set forth in the Contractor's health and safety plan. The Engineer may conduct duplicate air monitoring for quality control purposes. Modified Level D protection shall be the minimum requirement for all on-site personnel.

END OF SECTION

SECTION 01 52 13 - TEMPORARY FACILITIES

PART 1 -GENERAL

1.1 SCOPE OF WORK:

A. The Contractor shall provide all temporary facilities as described in this Section for the proper completion of the work, as required and as specified.

1.2 TEMPORARY FIELD OFFICE TRAILER:

A. Promptly at the start of work on the project, the Contractor shall furnish all labor, materials and equipment, perform all work to furnish, deliver, set up, and maintain for the duration of the project a field office trailer for the exclusive use of the Engineer, including the connection of electric and telephone services. The trailer and furniture shall be relatively new and in good condition and acceptable to the Engineer.

B. The office shall be adequately lighted for detailed working conditions, heated and air conditioned during the appropriate seasons. The office shall have at least one closet for storage of equipment. The Contractor shall enclose and weatherproof the areas beneath the trailer with insulation and exterior grade plywood.

C. The trailer shall be located at the work site where it will not interfere with the construction as approved by the Engineer, and shall be not less than 400 square feet. The trailer shall have provisions for locking and the Contractor shall provide two sets of keys to the Engineer.

D. Space shall be provided adjacent to the trailer for parking for the exclusive use of the Engineer and visitors to the Engineer’s trailer. The Contractor shall be responsible for snow removal, dust control etc. for the parking area.

1.3 TEMPORARY FIELD OFFICE TRAILER UTILITIES:

A. The Contractor shall provide for installation, maintenance, local and long distance telephone service and provide 2 touch-tone telephones with internal electronic that allows use with either touch-tone or digital pulse services and telephone shall be available always, both day and night. Provide a telephone answering machine or digital voicemail. Telephone service shall be compatible for use with a 56K/V90 Fax modem.

B. All electric services shall be continuously connected. Electric lights and adequate electric power, proper heat, hot water and satisfactorily cooled drinking water. Enough electrical outlets shall be provided and suitably located in the trailer for the equipment and desks specified in this section of the specifications. The trailer shall have thermostatically controlled heating and air conditioning units to maintain a minimum temperature of 68°F and a maximum temperature of 72°F.

C. Toilet facilities shall be provided and maintained in continual service; trash, garbage and other wastes shall be properly and satisfactorily disposed of. The toilet facility shall be built into the trailer or at minimum, a portable type as manufactured by Comfort Castle, Inc., Handy House Toilet Co., Port-o-Let, or an approved equal. This unit shall be installed as a complete facility with regular maintenance and pump-outs as required.

D. Janitor service, to keep the quarters and equipment neat and clean as acceptable working space, shall be furnished weekly by the Contractor. Repairs shall be made from time to time, as required by the Engineer.

E. The Contractor shall submit catalogs and vendors' data for the trailer and for the additional equipment and furnishings for review and approval by the Engineer.

1.4 TEMPORARY FIELD OFFICE TRAILER EQUIPMENT AND FURNISHINGS:

A. The Contractor shall also furnish the following, as a minimum:

1	Class ABC type Fire Extinguisher of at least 4-lb capacity
1	First aid kit as specified herein – **Refer to Paragraph 1.05 A below**
1	Double desk - Formica top with three 2 drawer, steel file cabinets under
2	Straight back chairs – metal
8	Folding metal chairs
1	3' X 6' Conference Table
1	Drafting table - 3' X 5'
1	Swivel type drafting stool with back - metal
1	Air conditioner - Automatic heating - gas or electric
1	Toilet facility
1	Electric water cooler with refrigerator compartment and continual supply of spring water and paper cups
1	Four-drawer filing cabinet with lock, fire proof or fire resistant
2	Wastebaskets with provisions for trash collection
1	Plan Rack
1	Printer/Copier/Fax/Scanner (plain paper) including paper and toner and dedicated phone line

1.5 TEMPORARY FIELD OFFICE TRAILER SAFETY EQUIPMENT:

A. FIRST AID KIT shall be wall mount cabinet and must include the following:

Band-Aids – Fingertip	1 Box
Band-Aids – Knuckle	1 Box
Band-Aids – Strip	1 Box
Band-Aids – Large Patch	1 Box
Band-Aids – Butterfly – Large	1 Box
Band-Aids – Butterfly – Small	1 Box
Triangular Bandage	1 Each
Compression Bandage	2 Each
Roller Bandage	2 Each
Gauze Pads (3"X3")	1 Box
Gauze Pads (4"X4")	1 Box
Waterproof Tape	1 Roll
Latex Gloves	1 Box
Anti-Microbial Towelettes	1 Box
Hydrocortisone Ointment Packets	1 Box
Antibiotic Ointment Packets	1 Box
Burn Gel Packets	1 Box
Scissors	1 Pair
Tweezers	1 Pair
Ice Packs- (Chemical Activated)	4 Each
Saline Eyedroppers	1 Box
CPR Pocket Mask	1 Each
Cotton Balls	1 Box
Flashlight with Working Batteries	1 Each

B. Contractor to provide stairs and platforms to doorway(s) of field offices and window shades, blinds, or curtains. Screens and storm windows shall also be provided.

1.6 TEMPORARY TOILETS:

A. The Contractor shall provide and pay all costs for toilet booths with chemical type toilets, as necessary for all persons engaged in the Work.

1.7 TEMPORARY WATER:

A. The Contractor shall make all arrangements for obtaining temporary water connections including extensions required for the needs of the Project, and shall pay all costs incurred. It shall furnish, install, and remove all equipment and piping required to provide temporary water. Contractor will need permission from Abington-Rockland Joint Water Works for utilizing hydrants and/or any other connections for their use.

B. The Contractor shall pay the costs of water for all Subcontractors and trades.

C. All water used for construction purposes shall be metered as follows:

(a) All persons desiring to use such water from a hydrant or any other appurtenances shall apply for a **Hydrant Permit at the Abington | Rockland Water Department**. A deposit is required for each permit which is renewable, if necessary, every ninety (90) days.

C. The Contractor shall provide cool drinking water and paper cups for all Subcontractors and trades.

D. When the permanent water distribution has been installed and tested it may be used as a source of water for construction purposes, provided that the Contractor pays all costs of operation, maintenance, and restoration of the system.

E. Contractor will NOT be charged for water associated with passing tank, pipe, or demonstration testing. Contractor will NOT be charged for water associated with dust control or normal construction operations. If Contractor is determined to be wasting water, the Owner will charge the Contractor at current published water rates for water wasted.

1.9 TEMPORARY ELECTRICITY:

A. The Contractor shall at his own expense make all arrangements for and provide all temporary light and power for all Subcontractors and trades, except as otherwise specified herein. The temporary electrical service shall include, but not be limited to, all labor, materials, and equipment necessary to supply temporary power of adequate capacity for the Project operations and testing. Transformers and meters, when required by the power company will be furnished and installed by the appropriate power company, and the Contractor shall pay all costs therefor.

B. The Contractor shall pay the cost of all electrical energy consumed during prosecution of the Work. The Contractor at his own expense shall maintain all lamps in operating condition. The Contractor and each Subcontractor shall furnish their own extension cords and all additional lamps as they may require. Temporary wiring of a special nature not otherwise specified, shall be furnished, installed, maintained, and paid for by the trade requiring such wiring.

C. All temporary work shall be furnished and installed in conformity with the National Electrical Code and state and city laws, and requirements of the applicable power company. Particular attention is called to the **Commonwealth of Massachusetts 454 CMR 10.0, "Construction Industry Rules and Regulations".**

D. The Contractor shall dismantle and completely remove from the Project all temporary wiring and other temporary electrical accessories only when the permanent electrical system has been installed and in operation, and then only with written approval of the Engineer.

1.10 TEMPORARY STRUCTURES:

A. The Contractor shall provide, maintain, and remove such additional storage sheds, temporary buildings, or trailers as required for performance of the Work. Location of all such temporary structures shall be acceptable to the Engineer. If the Contractor is required to relocate these Temporary Structures during the prosecution of the Work, the Contractor shall promptly do so at no increase in Contract Price or Contract Time.

1.11 SCAFFOLDING, STAGING, AND PLANKING:

A. General: all subcontractors including Filed Sub-bid contractors, herein referred to as subcontractor, shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified and herein.

1. Scaffolding and staging required for use by subcontractors shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by the subcontractor requiring such scaffolding.
2. Each subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions.
3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of the subcontractor, are the responsibility of the subcontractor.
4. Enclose all exterior scaffolding at end of each workday to prohibit access to the scaffolding by unauthorized individuals.

1.12 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by the subcontractor and Filed Sub-bid contractor performing work shall be furnished, installed, operated and maintained in safe conditions by this subcontractor or Filed Sub-Bid Contractor performing his work.

1.13 TEMPORARY STAIRS, RAMPS, AND CHUTES:

A. The Contractor at its own expense shall furnish, install, and maintain all temporary ramps, stairs, ladders, and chutes as required by the Contractor, all Subcontractors and trades for the proper completion of the Work. The Contractor shall remove these and other like items when they are no longer required and permanent stairs are installed.

B. When permanent stairs are erected the Contractor shall provide all required safety measures including temporary railings, protective treads, and other protective measures.

1.14 WEATHER PROTECTION:

A. The Contractor's attention is directed to **M.G.L. Chapter 149, §44G(d), and to "Weather Protection Standards" established by the Deputy Commissioner of the Massachusetts Division of Capital Asset Management and Maintenance**.

1. It is the intent of these Specifications to require the Contractor to provide temporary enclosures and heat to permit construction work to be carried on during November through March in compliance with **M.G.L. Chapter 149, §44G(d)**. These Specifications are not to be construed as requiring enclosures or heat for operations that are economically not feasible in the judgment, in writing, of the Contractor. Included in this category, but without limitation, are such items as site work, excavation, roofing, and similar operations.

2. "Weather Protection" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosure, and/or heating. This protection shall provide adequate working areas during November through March, inclusive as determined by the Contractor and consistent with the approved construction necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install all weather protection materials required for the Work or any part thereof, and shall be responsible for all costs, including heating required to maintain a minimum temperature of 40 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction and/or curing of materials.

3. The Contractor may, with the prior written approval of the Engineer, elect to utilize the permanent heating system for temporary heat after the building is enclosed and after it has been tested and is ready to operate. However, is shall be the Contractor's responsibility to have all portions of the permanent heating system that are used during construction thoroughly cleaned and restored to first-class condition to the satisfaction of the Engineer.

4. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices.

B. The Contractor shall pay the costs of all fuel and electricity required for temporary heating until Substantial Completion.

C. Responsibility for Weather Protection:

1. The Contractor shall be entirely responsible for all weather protection during the Contract Time, and shall be liable for any damage to the Work, or any part thereof caused by the Contractor's failure to supply adequate and proper weather protection.

2. Any work damaged by frost shall be promptly removed and replaced by the Contractor at no increase in Contract Price or Contract Time.

1.15 TEMPORARY HEAT:

A. The Contractor shall be responsible for all temporary heat. The temporary system shall be completely independent of the permanent heating system. The Contractor shall furnish, install, and pay for an independent system of sufficient capacity to service the needs of the Project and to protect the existing building's fixtures, equipment finishes and mechanical systems from damage during the Contract Time.

B. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices.

C. The Contractor shall furnish and install one accurate automatic recording Fahrenheit thermometer at each place designated by the Engineer to ensure that specified temperatures are maintained.

D. The Contractor shall pay costs of all fuel, electricity, temporary boilers, devices, accessories, and all necessary wiring and controls required for temporary heating until Substantial Completion.

E. The Contractor shall be responsible for all temporary heat during the Contract Time, and shall be liable for any damage to the Work, or any part thereof caused by the Contractor's failure to supply adequate and proper temporary heat.

PART 2 - PRODUCTS

NOT PART OF THIS SECTION

PART 3 - EXECUTION

3.1 UTILITIES:

A. All monthly service charges for telephone, electricity, Dial-Up connection service, water supply, and heating of the Temporary Field Office Trailer shall be paid for by the Contractor.

3.2 COMPUTER EQUIPMENT:

A. All monthly charges and maintenance fees for the computer system and digital camera and associated hardware and software licenses provided shall be paid for by the Contractor.

3.3 TEMPORARY FACILITIES:

A. The CONTRACTOR shall perform the following work:

1. Protect excavations, trenches, buildings, and materials always form rain and/or ground water, and from water damage of any origin. Provide all pumps, piping, coverings, and other materials and required equipment as specified.
2. In addition to the weather protection during November through March specified in paragraph 1.13, provide temporary weather tight enclosures for openings in exterior walls and in roof decks when and as required to protect the Work from damage by inclement weather, and to protect occupied spaces.
3. Permanent window enclosures may be utilized. Permanent door enclosures shall not be used as temporary enclosures, but temporary framed plywood or wood batten doors hardware shall be provided.
4. Protect sills, jambs, and heads of openings through which materials are handled.
5. Protect concrete surfaces which are to receive work of other Subcontractors and trades from any soiling which will prevent proper adhesion of subsequent work. The Contractor shall leave surfaces broom clean and free of all blemishes at the
6. Roof and waterproofed surfaces shall not be subjected to traffic nor used for storage of materials. The Contractor shall provide protection for such surfaces where some activity must take place to carry out the Work.

B. After the Work of a Subcontractor has been properly completed, the Contractor shall be responsible for its protection and for repairing, replacing, or cleaning any such Work which has been damaged by other Subcontractors or trades or by any other cause, so that the entire Work is in perfect condition at the time of Substantial Completion.

END OF SECTION

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SECTION 01 56 26 – TEMPORARY CHAIN LINK FENCE

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The Contractor shall provide all labor, materials and appurtenances necessary for the installation, maintenance and dismantling of 8-foot temporary fencing.

B. The Contractor shall be responsible for securing the site from trespassers. Existing fencing exists on portions of the site as shown on the Contract Drawings; it will be at the discretion of the Contractor to determine whether the existing fence is suitable for site safety and security. The Contractor shall install temporary fencing across lengths of damaged/unsuitable fencing to secure the site and prevent trespassers.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 00 SUBMITTAL PROCEDURES, SUBMIT THE FOLLOWING:

A. Manufacturer’s literature of the materials specified herein.

B. Shop drawings of the temporary chain link fence and gates.

1. Shop drawings shall indicate layout of temporary fencing, location and size of gates, existing pavement and roads, and other site-specific conditions. Prepare drawing after site observation and verification of existing conditions.

PART 2 - PRODUCTS

2.01 TEMPORARY CHAIN LINK FENCING

A. Unless otherwise indicated, type of 8-foot temporary chain link fencing shall be Contractor's option. Following types are acceptable:

1. New materials or previously used salvaged chain link fencing in good condition.

2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.

3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

B. Gates: Provide gates of the quantity and size indicated on the Contract Drawings or required for functional access to Site.

1. Fabricate of same material as used for fencing.

2. Vehicle gates:

a. Minimum width: 20 feet to allow access for emergency vehicles.
b. Capable of manual operation by one person.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The fence and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer and these specifications. These specifications shall take precedence over the recommendations of the manufacturer if any discrepancy exists between them.

B. Posts

1. Maximum post spacing shall be 10-feet. Post spacing shall be uniform and posts shall be plumb.

2. Drive posts, set in holes and backfill, or anchor in precast concrete blocks.

3. For soft and unstable ground conditions, cast concrete plug around post.

4. Posts over pavement: Use steel post plates or precast concrete blocks.

5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.

6. Temporary terminal posts shall be securely connected to existing fence posts to prevent site access/trespassing.

C. Securely attach wire fabric to posts. Maximum area of unbraced fence fabric shall not exceed 1,500 square feet.

D. Install with required hardware.

E. Fabric shall be stretched taut, with the bottom edge following the existing grade, and shall be a continuous mesh between terminal posts. Each span of fabric shall be attached independently at terminal posts. Where terminal posts do not have provisions for weaving fabric to posts, stretcher bars shall be placed through the end weave of the fabric and secured to the post with bar bands spaced not more than 15-inches apart on the post. Temporary terminal posts shall be secured to existing fence posts to prevent Site access/trespassing.

F. Fabric shall be attached with ties to line posts at intervals of not more than 14-inches (and to the top railing and braces at intervals not exceeding 24-inches).

G. The bottom tension wire shall be interlaced in the weave of the fabric, pulled taut and fastened to terminal posts.

3.02 MAINTENANCE AND REMOVAL

A. Maintain fencing in good condition. If damaged, immediately repair.

B. Remove temporary fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

END OF SECTION 01 56 26

SECTION 01 57 19 – ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to wetlands, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied, all of which are attached to Section 00 31 43, PERMITS.

D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 RELATED WORK:

A. Section 00 31 43 – PERMITS

B. Section 01 14 19.16 – DUST CONTROL

C. Section 01 33 00 – SUBMITTAL PROCEDURES

D. Section 31 00 00 – EARTHWORK

E. Section 31 23 19 – DEWATERING

F. Section 31 50 00 – SUPPORT OF EXCAVATION

1.03 SUBMITTALS:

A. The Contractor shall submit details and literature fully describing environmental protection methods to be employed in carrying out construction activities less than 100 feet from wetlands and in proximity to areas designated as wetlands.

PART 2 - PRODUCTS

2.01 SILT FENCE:

A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.

B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getsco, Concord, NH, or approved equal.

C. Silt fence properties:

Physical Properties	**Test Method**	**Minimum Value**
Grab Strength, lbs.	ASTM-D-4632	124
Grab Elongation, %	ASTM-D-4632	15
Mullen burst, psi	ASTM-D-3786	300
Puncture, lbs.	ASTM-D-4833	65
Trapezoidal Tear, lbs.	ASTM-D-4533	65
UV Resistance2, %3	ASTM-D-4355	80@500 hrs.
AOS, US Sieve No.	ASTM-D-4751	30
Flow Rate, gal/min/sq ft	ASTM-D-4491	10
Permittivity,(1/sec)gal/min/sq ft	ASTM-D-4491	0.05 sec^{-1}

2.02 COMPOST FILTER TUBES:

A. Compost filter tubes shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8” to 1/4” diameter. The mesh material will either photo degrade within one year or be made of nylon with a life expectancy of 24 months. The sock shall be filled with a mix of composted leaf mulch, bark mulch, and wood chips that have been composed for at least one year. The sock will have a minimum diameter of 12-inches.

2.03 CATCH BASIN PROTECTION:

A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or its authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine its construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters. Island Grove Pond is located across the street and special care shall be taken to mitigate any potential run-off into the pond.

3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as within wetland resource areas.

B. The Contractor shall perform its work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations outside of the trench limits. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.

D. Excavated materials shall not be permanently placed or temporarily stored in areas designated as wetlands. Temporary storage areas for excavated material shall be as required by the Engineer.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in its operations.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by its blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 DISCHARGE OF DEWATERING OPERATIONS:

A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

3.09 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct its operations and maintain the area of its activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01 14 19.16, DUST CONTROL.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.10 SEPARATION AND REPLACEMENT OF TOPSOIL:

A. Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

3.11 ERECTION AND MAINTENANCE OF SILT FENCE:

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

3.12 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sack shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sack from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The Contractor shall properly dispose of all debris at no additional cost to the Owner.

B. All catch basin protection shall be removed by the Contractor after construction is complete.

3.13 COMPOST FILTER TUBES:

A. The compost filter tubes will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

B. The compost filter tubes shall be regularly inspected and before and after every forecasted major weather event. All deposited sediment shall be removed and not allowed to accumulate to the top of the compost filter tubes. Compost filter tubes damaged during construction shall be repaired or replaced as required by the Engineer at no additional cost to the Owner.

B. The Contractor shall remove all compost filter tubes after construction is completed.

END OF SECTION 01 57 19

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 01 77 00 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight,

dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures."

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:
    a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
    b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

    1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
    2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
    3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

    1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
    2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
    3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
    4. Where products are accompanied by the term "as selected," Architect will make selection.
    5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
    6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

        a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

    1. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 33 00 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.

B. Related Requirements:

C.

1. Section 01 33 00 "Submittal Procedures" for submitting surveys.
2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
3. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect Owner’s Project Manager of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

    a. Contractor's superintendent.
    b. Trade supervisor responsible for cutting operations.
    c. Trade supervisor(s) responsible for patching of each type of substrate.
    d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Layout Conference: Conduct conference at Project site

1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect Owner’s Project Manager of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

    a. Contractor's superintendent.

    b. Professional surveyor responsible for performing site survey serving as basis for Project design.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor

B. Certified Surveys: Submit two copies signed by land surveyor

C. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.7 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: Refer to Section 01 40 00 "Quality Requirements."

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.

   f. Mechanical systems piping and ducts.
   g. Control systems.
   h. Communication systems.
   i. Fire-detection and -alarm systems.
   j. Conveying systems (Cranes)
   k. Electrical wiring systems.
   l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior storefront construction.
   d. Equipment supports.
   e. Piping, ductwork, vessels, and equipment.
   f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect & Owner’s Project Manager in accordance with requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect and Owner’s Project Manager promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect and Owner’s Project Manager when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Owner's Project Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Owner's Project Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Owner's Project Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

   1. Comply with Section 01 77 00 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend

preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 52 00 "Temporary Facilities."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.10 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

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SECTION 01 73 29 - CUTTING, CORING AND PATCHING

PART 1 - GENERAL

1.1 WORK INCLUDED:

This Section covers the cutting, coring, rough and finish patching of holes and openings in existing structures.

PART 2 - PRODUCTS

2.1 SEALING MATERIALS:

A. Mechanical seals shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40 feet of head or 20 psig. Mechanical seals shall be Link-Seal, manufactured by Thunderline Corp., Wayne, MI., or approved equal.

B. Sealant shall be a two part foamed silicone elastomer as manufactured by Dow Corning Co., product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corporation, or approved equal. Packing shall be a fire retardant pliable material, Fig. 310 by Sealtite Co.; White Oakum W.S.-600 by American Manufacturing Co., or approved equal. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.2 MISCELLANEOUS MATERIALS:

A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corporation, or equivalent by Euclid Chemical Corporation, Master Builders Company, or approved equal.

B. Non-shrink grout shall be Masterflow 713 by Master Builders Company; Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or approved equal.

C. Materials for finish patching shall be equal to those of adjacent construction.

PART 3 - EXECUTION

3.1 GENERAL:

A. The Contractor shall leave all chases or openings for the installation of his own or any other contractor's or subcontractor's work, or shall cut the same in existing work, and shall see that all sleeves or forms are at the work and properly set in ample time to prevent delays. He shall see that all such chases, openings, and sleeves are located accurately and are of proper size and shape and shall consult with the Engineer and the contractors and subcontractors concerned in reference to this work.

B. In case of his failure to leave or cut all such openings or have all such sleeves provided and set in proper time, Contractor shall cut them or set them afterwards at his own expense, but in so doing he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the written consent of the Engineer.

C. The Contractor shall not cut or alter the work of any subcontractor or any other contractor, nor permit any of his subcontractors to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered or with the written consent of the Engineer. All cutting and patching or repairing made necessary by the negligence, carelessness, or incompetence of the Contractor or any of his subcontractors shall be done by or at the expense of the Contractor and shall be the responsibility of the Contractor.

D. All cutting and coring shall be performed in such a manner as to limit the extent of patching.

E. All holes cut through concrete and masonry walls shall be core drilled unless otherwise approved. No structural members shall be cut without the approval of the Engineer and all such cutting shall be done in a manner required by him. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.

3.2 CORING:

A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.

B. If holes are cored through floor slabs they shall be drilled from below.

C. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.

D. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

E. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

3.3 CUTTING:

A. Cutting shall be performed with a concrete saw and diamond saw blades of proper size and application.

B. Provide for control of slurry generated by sawing operation on both sides of wall or slab.

C. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in the structure. Cut shall be made so that steel neither protrudes nor is recessed from the face of the cut.

D. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

E. Provide equipment of adequate size to remove cut panel.

3.4 PATCHING:

Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.

END OF SECTION

SECTION 01 74 13 - CLEANING UP

PART 1 - GENERAL

1.1 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

1.2 RELATED WORK:

A. Section 00 72 00 GENERAL CONDITIONS

B. Section 01 11 00 CONTROL OF WORK AND MATERIALS

C. Section 01 14 00 SPECIAL PROVISIONS

D. Section 01 57 19 ENVIRONMENTAL PROTECTION

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3.1 DAILY CLEANUP:

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

3.2 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

3.3 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.4 RESTORATION OF DAMAGED PROPERTY:

A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

3.5 FINAL CLEANUP:

A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

B. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the building to a "like new" condition. This cleanup shall include removing all trash and debris from the premises; sweeping and mopping of all floors; washing of all walls, windows and doors; cleaning and polishing of all finish metal surfaces; cleaning of all equipment, utilizing proper solvents for removal of oil and grease; cleaning of dirt and debris out of all mechanical and electrical cabinets; and all other related work required to render the building suitable for use. Before acceptance, the Engineer shall approve the condition of the building.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
2. Section 01 32 33 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
3. Section 01 78 23 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
4. Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect and Owner’s Project Manager. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's, Owner’s Project Manager, & Owner's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Owner’s Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Owner's Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

  1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

  1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
  2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect
    d. Name of Owner's Project Manager (OPM)
    e. Name of Contractor.
    f. Page number.

  4. Submit list of incomplete items in the following format:

    a. MS Excel Electronic File: Architect, through OPM, will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

   1. Submit by uploading to web-based project software site.

E. Warranties in Paper Form:

   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove labels that are not permanent

g. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
h. Leave Project clean and ready for use.

C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 52 00 "Temporary Facilities”.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 01 73 00 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 01 77 00

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.

4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Name and contact information for for OPM.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

   1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
   2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
   3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

   1. Fire.

2. Flood.
3. Gas leak.
4. Power failure.
5. System, subsystem, or equipment failure.
6. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.

3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. As-Built Survey after work is completed.
2. Record Drawings.
3. Record specifications.
4. Record Product Data.
5. Miscellaneous record submittals.

B. Related Requirements:

1. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 SURVEY – POST CONSTRUCTION

A. The Contractor shall perform a post-construction survey of the entire project area. The topographic survey shall be performed by or under the supervision of and certified by a Registered Land Surveyor in the State of **Massachusetts.** The Contractor shall also submit to the Engineer a minimum 20 gigabyte flash drive with the electronic pre- and post-construction survey files. The Contractor shall send the electronic post-construction survey files to the Engineer which shall be developed in AutoCAD 2016 and the submittal shall include the Final AutoCAD DWG file documents, drawing line types, blocks, etc. The actual version of AutoCAD shall be coordinated with the Engineer. The Contractor shall notify the Owner and Engineer at least 48-hours in advance of each survey.

1.4 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
2) Submit Record Digital Data Files
3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit Record Digital Data Files
   a) Pdf's
   b) DWG's
2) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report monthly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.5 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an acceptable drawing technique.
   c. Record data as soon as possible after obtaining it.
   d. Record and check the markup before enclosing concealed installations.
   e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Owner’s Project Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: DWG Version Autocad 2016 minimum on Microsoft Windows operating system.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect through Owner’s Project Manager for resolution.
5. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 01 31 00 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect
    e. Name of Owner's Project Manager
    f. Name of Contractor.

1.6 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.7 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.8 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.9 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Owner’s Project Manager reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

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SECTION 02 61 00.16 - HANDLING, TRANSPORTATION, REUSE AND OFF-SITE DISPOSAL OF EXCAVATED MATERIAL

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK:

A. In general, the Contractor shall maximize the reuse of excavated materials to minimize the generation of surplus material requiring off-site disposal as required by the Engineer and specified herein.

B. The Work of this Section consists of all labor, equipment, materials, and services for excavating, temporary stockpiling at the Site, handling, segregating, tracking, and management of excavated material, including transporting, and off-Site recycling and/or disposal of surplus/unusable material as directed by the Engineer, generated during the course of the Work. With reference to Contract Drawing C201, material requiring excavation has been identified as two primary areas of the site – the Native Soil Excavation area and the Fill Soil Excavation area. Native Soils do not need to be characterized as part of the EMMP unless required by the Contractors' receiving facility(ies).

C. The Contractor is responsible for sample collection and laboratory analysis of representative disposal characterization samples to obtain acceptance of any excavated materials to be transported off-site to recycling/disposal facilities as specified herein.

D. For the purpose of this contract, the Contractor shall assume the following:

1. Quantity of Native Material and Group A – Non-impacted Material to be excavated, segregated, stockpiled, loaded, and legally hauled for offsite reuse/disposal/recycling shall be determined by the Contractor prior to bidding. Native Material and Group A Non-impacted Material shall be removed from the site and legally reused or disposed off-site by the Contractor at no additional cost to the Owner. Quantities shall be determined by the Contractor based on the proposed work as shown in the Construction drawings.

2. Quantity of soil category Group B Impacted Material to be excavated, segregated, stockpiled, sampled, loaded and legally hauled for offsite reuse/disposal/recycling shall be 1,000 tons.

1.2 RELATED WORK:

A. Section 00 31 32 – GEOTECHNICAL SUBSURFACE DATA

B. Section 00 31 33 – ENVIRONMENTAL SUBSURFACE DATA

C. Section 00 31 43 – PERMITS

D. Section 01 14 19.16 – DUST CONTROL

E. Section 01 35 29 – HEALTH AND SAFETY PLAN

F. Section 01 57 19 – ENVIRONMENTAL PROTECTION

G. Section 31 00 00 – EARTHWORK

1.3 SUBMITTALS:

A. Submit to the Engineer, for review, and in accordance with the requirements of the general specifications, the information required by Paragraph 1.03.B of this Section, no more than 14 days after issuance of the Notice to Proceed.

B. Excavated Materials Management Plan (EMMP) for Construction in the Work Area.

The EMMP shall include the following:

1. Plans and procedures for the excavation of soil as shown on the Contract Drawings.

2. Plans and procedures for the segregation, stockpiling, characterization sampling (where required), on-site management, loading, transport and off-site disposal/recycling of surplus excavated materials. The EMMP shall include a plan showing proposed locations of soil stockpiling areas. Provide a schedule detailing the proposed sequence of excavation, stockpiling, sampling and transport for off-site disposal/recycling. Refer to Paragraph 3.03 and 3.04 of this Section.

3. All pertinent information relating to the transport of surplus excavated material. The information, at a minimum, shall include:

    a. Name and address of all transporters.

    b. Transporter identification number (USEPA or Massachusetts Department of Transportation Transporter) and expiration date.

    c. Proof of permit, license, or authorization to transport surplus excavated material, when applicable, in all affected states.

    d. Dust control measures.

4. For Group A and Group B soils, identify each waste stream and propose appropriate

disposal/recycling facilities that will accept the surplus material. The Contractor shall submit to the Engineer, approvals or letters of intent and facility information for each facility proposed, within 7 days of issuance of the Notice to Proceed. The Contractor shall submit names of two (2) facilities for each category of surplus excavated material, as identified in Paragraph 3.04 of this Section. Disposal/recycling facilities listed in the EPA Superfund Program will not be accepted as disposal/recycling facilities for this Work. For each facility, the Contractor shall submit the following information:

a. General Information

  i. Facility Name
  ii. Facility Address
  iii. Name of Contact Person
  iv. Title of Contact Person
  v. Telephone Number of Contact Person
  vi. Permit Number

b. The facility shall specify the volume of material that can be accepted from the Site on a weekly and a total basis.

c. The facility shall provide written confirmation that they are permitted to accept and will accept the surplus excavated material of the general quality and quantity described by these Specifications.

d. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils or materials specified in this Contract.

e. The Contractor shall submit a complete list of the disposal facility’s permitted allowable contaminant levels and physical characteristic requirements for contaminated material, and list any required regulatory approvals for individual waste streams

5. Documentation of an emergency service agreement between the Contractor and a certified emergency response contractor.

6. Procedures for decontamination of vehicles and equipment.

C. Laboratory results for all samples collected and/or analyzed by the Contractor shall be submitted to the Engineer within 2 days of receipt in tabulated spreadsheet form summarizing detections and exceedances of applicable criteria along with the raw laboratory data package. The results shall include all Chain-of-Custody forms and all documentation provided by the laboratory, including MCP data enhancement requirements. Analytical data shall be kept confidential, distributed only to the Engineer.

D. As part of the EMMP, the Contractor shall develop a Sampling and Analysis Plan (SAP) outlining the procedures for the characterization of all excavated materials to obtain off-site disposal/recycling facility acceptance. The SAP shall include, but is not limited to, the following:

 1. The name and copies of all applicable certifications of the Contractor's proposed analytical laboratory to perform disposal characterization laboratory analysis.

 2. Proposed off-site disposal/recycling facility sampling and material acceptance requirements.

 3. Disposal characterization sampling procedures.

 4. Laboratory analytical methods used to analyze disposal characterization samples.

 5. Quality assurance and quality control procedures to be implemented during sampling collection and laboratory analysis.

1.4 REFERENCES:

A. Massachusetts Department of Environmental Protection (DEP) Policy Number:

 1. WSC-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils.

 2. WSC-94-320, Construction Activities in Contaminated Areas.

 3. COMM-97-001, Reuse and Disposal of Contaminated Soils at Massachusetts Landfills.

B. Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.

C. Toxic Substances Control Act (TSCA), 40 CFR 761.00.

D. Massachusetts Hazardous Waste Regulations, 310 CMR 30.000, Massachusetts Solid Waste Regulations, 310 CMR 19.000 and the Resource Conservation Recovery Act (RCRA), 40 CFR 148 and 268.

E. All other applicable Federal, State, and local regulations. It is the Contractor's responsibility to know, understand, and abide by all such regulations and common practices. In the event of a conflict, the most stringent regulations shall govern.

1.5 DEFINITIONS:

A. Excavated Material: All soil, sediment, sewer grit, and miscellaneous materials and/or debris excavated from with the limit of work.

B. Surplus excavated Material: Soil, sediment, vegetation, grit, and miscellaneous materials and/or debris excavated from within the limit of work and surplus to on-site backfilling requirements or geotechnically unsuitable for use on-site.

C. Native Material: Native materials are defined as natural soils consisting of natural topsoil, subsoil, and sand located throughout the limit of work.

D. Non-impacted Material: Fill soil containing constituent concentrations as determined by off-Site laboratory analysis to be less than the MCP RCS-1 standards

E. Impacted Material: Surplus excavated material containing contaminant concentrations equal to or greater than MCP reportable concentrations (RCs).

F. Suspected Impacted Material: Surplus excavated material with any of the following characteristics: significant petroleum and/or chemical odor; oily sheen or free-phase petroleum product; and/or material with staining or significant change of color.

G. LSP: Licensed Site Professional, a hazardous waste site cleanup professional, as defined in M.G.L. c. 21A § 19, holding a valid license issued by the Board of Registration of Hazardous Waste Site Cleanup Professionals, pursuant to M.G.L. c. 21A, §§ 19 through 19J.

H. LSP-of-Record: The LSP engaged by the Owner to perform LSP-of-Record Services and regulatory interaction/coordination of the Project. The Engineer will LSP-of-Record for the Project.

I. Refer to Paragraph 3.04 of this Section for the definitions of the excavated material categories.

1.6 PERMIT REQUIREMENTS:

A. The Contractor shall obtain all Federal, State, and local permits required for the transport and disposal of surplus excavated material. The Contractor shall adhere to all permit requirements.

B. The Contractor shall document that the disposal facilities proposed have all current certifications and permits as required by Federal, State, and local regulatory agencies to receive and dispose of the surplus excavated material.

1.7 EXISTING CONDITIONS:

A. Work under this Project will occur within the Limits of Work shown on the Contract Drawings.

1.8 QUALITY CONTROL:

A. The Contractor shall perform the following:

1. Completed the 40-hour OSHA health and safety training course, with current 8-hour OSHA refresher training for all workers who requires such training.

2. Performance of characterization sampling required for the disposal of surplus excavated materials to meet all State and Federal regulations and disposal requirements. Characterization sampling may only occur with the observation of the Engineer.

3. Preparation of draft Material Shipping Records (MSRs), Hazardous Waste Manifests and/or Bills of Lading (BOLs) for transportation of surplus excavated materials. Such documents shall be submitted to the Engineer for review and comment. The Owner's LSP (the Engineer) shall sign all BOLs prepared by the Contractor upon final approval. The Contractor shall be responsible for submitting completed Massachusetts BOLs, hazardous waste manifests, MSRs, and other shipping documents to the Engineer within two weeks of shipment to a disposal/recycling facility.

4. Prepare the necessary documents to transport and dispose/recycle of stockpiled material and submit the executed transportation and disposal/recycle documents to the appropriate Federal, State and Local agencies with copies of all documents submitted to the Engineer in the required time-frame for submittal.

5. Preparation, signing, and stamping of all final LSP Opinions submitted to DEP for any response actions taken during the project for releases of oil and/or hazardous materials caused by the Contractor.

6. Ensuring compliance with all references listed in Paragraph 1.04 of this Section.

7. Ensuring that the work shall conform to local, State and Federal regulatory agencies governing the handling of contaminated and hazardous materials.

8. Ensuring that Best Management Practices shall take place while performing the work described in this Section.

9. Develop and implement Site-specific emergency response and health and safety protocols and procedures.

10. Advise the Engineer at least five (5) working days in advance of the schedule for off-Site disposal/recycling.

11. Keep records, including daily logs and photographs, of all waste streams, weights, stockpiles, and surplus excavated materials for the purposes of tracking points of origin.

12. Develop and implement dust control measures, which will adequately protect workers and residents in the nearby community and prevent off-Site migration of dust. Refer to Section 01 14 19.16 – DUST CONTROL.

PART 2 – PRODUCTS

2.1 GENERAL:

A. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this Work as indicated in Section 01 35 29 – HEALTH AND SAFETY PLAN.

B. If containers are used by the Contractor for storing and/or hauling the surplus excavated material, the containers shall be constructed of steel, in good condition and designed for the intended purpose of safe, secure storage of contaminated and hazardous materials during loading and transport. The containers shall have a secure cover that will prevent a release of material from truck during transportation. The containers and covers shall be at no additional cost to the Owner and shall be approved by the Engineer prior to mobilization of trucks/containers. The containers must be approved by and labeled in accordance with the U.S Department of Transportation (DOT). The containers shall be sift-proof and water resistant in accordance with the DOT.

C. The Contractor shall decontaminate vehicles, construction equipment, tools and appliances used during the Work as required in Section 01 35 29 – HEALTH AND SAFETY PLAN and Section 01 14 19.16 – DUST CONTROL.

2.2 FILL MATERIALS:

A. Backfill material shall be in accordance with Section 31 23 00 – EARTHWORK.

2.3 STOCKPILE SHEETING

A. 10-mil (minimum) nylon-reinforced polyethylene (NRPE) or 10-mil (minimum) polyethylene sheeting shall be used for all stockpile cover sheeting.

B. NRPE sheeting conform to the following specifications:

1. Membrane shall be manufactured of new, first quality product designed and

manufactured specifically for its intended use.

2. The material shall be 10-mil polyethylene reinforced with a non-woven grid of high strength nylon cord.

3. The material shall be ultra-violet resistant and cold crack resistant to -40 degrees Fahrenheit.

4. The materials shall be manufactured in a minimum 12-foot seamless width. Labels on the rolls shall identify the thickness, width and manufacturer’s mark number.

PART 3 – EXECUTION

3.1 GENERAL:

A. For all soils requiring disposal/recycling, the Contractor shall perform disposal characterization sampling and analytical testing of the surplus excavated material as required by the permitted disposal/recycling facility.

B. Based upon all analytical results, the Contractor shall transport and dispose/recycle the surplus excavated material as specified in Paragraphs 3.07 and 3.08 of this Section.

C. The Owner will be the generator of all surplus excavated materials removed from the Site and will sign all manifests, MSRs, and BOLs. The Contractor shall be the generator of material contaminated as a result of the Contractor or Sub-Contractors release of oil/hazardous materials on the Site caused by them. The Contractor shall prepare all Bills of Lading, Material Shipping Records, and Hazardous Waste Manifests and shall submit all transportation paperwork to the Engineer for approval prior to shipment. The Owner’s LSP (the Engineer) shall sign all Bills of Lading upon final review and approval (with the exception of spills caused by the Contractor, which will be the Contractor’s responsibility).

D. The Owner shall have final approval over all disposal/recycling options based on the analytical data.

E. Immediately notify the Engineer of visible stains or unnatural odor of any surplus excavated material, or if suspected contaminated and/or hazardous material is encountered. Excavate and stockpile areas of suspected contaminated and/or hazardous material as required by the Engineer and the procedures described in this Section.

F. The Contractor shall coordinate with the Engineer to establish and maintain soil stockpile(s) volume using appropriate survey instrument layout techniques, as well as establish vertical control points in the vicinity of the soil stockpile areas such that volume of the stockpile(s) can be readily determined from instrument survey and approved by the Engineer.

G. An LSP Opinion from the Owner's LSP shall be required for all material shipped using a Massachusetts Bill of Lading.

H. The Contractor shall remove rubble, metal, wood, plastic, and other debris materials in soils as necessary, via screening or other suitable means and methods, to meet acceptance criteria for the selected disposal/re-use facility.

3.2 DISPOSAL CHARACTERIZATION SAMPLING:

A. Disposal Characterization Sampling

1. All disposal characterization sampling and analysis performed by the Contractor shall be at no additional cost to the Owner.

2. The Contractor shall be responsible for sampling and characterizing surplus excavated material for the purpose of obtaining approvals from the disposal/recycling facility(ies). The majority of Native Soil Excavation area is beyond the tree line as shown in Contract Drawing C201. Native Soils do not need to be characterized unless required by the Contractors' receiving facility(ies). Any native material that is located below fill material on-site and within the Fill Soil Excavation area shall be characterized in accordance with the receiving facility requirements.

3. The Contractor shall provide the Engineer with a minimum of 2 days' notice prior to sampling and shall not sample unless Engineer's approval is received and the Engineer is present to witness the collection of the samples.

   a. The Contractor shall perform all sampling and analysis of stockpiled surplus excavated material as required by potential receiving facilities and this Section.

   b. The Contractor shall collect additional samples to perform additional testing of the surplus excavated material as required by the disposal/recycling facility(ies) at no additional cost to the Owner.

4. The collected samples shall be submitted, at a minimum, for the following chemical analyses: total petroleum hydrocarbons (TPH) using modified EPA Method 8100, semi-volatile organic compounds (SVOCs) using EPA Method 8270, volatile organic compounds (VOCs) using EPA Method 8260, polychlorinated biphenyls using EPA Method 8082, MCP 14 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, selenium and silver) using Method 6010/7471, reactive cyanide and sulfide using EPA Method SW-846, ignitability using modified EPA Method 1010, corrosivity using EPA Method 9045, and conductivity using EPA Method 120.1. Any samples found to contain contaminant concentrations equal to or greater than "20 times" their hazardous waste toxicity

threshold (i.e., the 20-times rule) shall be analyzed for toxicity characteristic leaching procedure (TCLP).

5. Submit a copy of all chemical analyses and a tabulated summary of the data in Microsoft Excel format to the Engineer within 2 days of receipt of the laboratory report, per Paragraph 1.03.C of this Section.

6. Take samples in such a manner as not to cause any cross-contamination. All sampling equipment shall be decontaminated between usage.

7. All analyses shall be performed by a laboratory certified for such analyses by the Commonwealth of Massachusetts.

8. The Engineer may stop the Contractor’s work in a particular location at any time in order to have samples taken and analyzed. If necessary, the Contractor shall assist the Engineer in collecting samples. The work shall not resume in that area until authorized by the Engineer. Stoppage of work for this reason, or until laboratory results are delivered to the Engineer, shall not be a cause for the Contractor to request additional compensation or an extension of time to the Contract or to other intermediate Contract deadlines.

3.3 TEMPORARY STOCKPILING OF SURPLUS EXCAVATED MATERIALS:

A. The Contractor shall be allowed to stockpile surplus excavated material on-site pending approval/manifests for transport and disposal or reuse if the following conditions are met:

1. The stockpiled impacted material must be removed off-site as soon as possible and in all cases within 90 days from the day of its initial excavation for hazardous waste and 120 days for non-hazardous waste (hazardous waste as defined in 310 CMR 30.0000 and RCRA).

2. The stockpiled impacted material shall be placed on 20-mil (minimum) polyethylene sheeting and covered with 10-mil (minimum) polyethylene sheeting or 10-mil nylon sheeting. The cover shall be secured such that it is not blown off by wind. The Contractor shall immediately cover any stockpile where the cover has been blown off by wind or is uncovered for any reason at no additional cost to the Owner.

3. The polyethylene sheeting shall be bermed around the edges to prevent any infiltration of stormwater or exfiltration of leachate.

4. The base of the temporary stockpile shall be sloped to create leachate collection points. Collect and appropriately dispose of all leachate generated from the stockpiles.

B. If any one of these conditions cannot be met, then the Contractor shall store impacted material in water-tight containers at no additional cost to the Owner pending transportation and disposal. The containers must be removed off site within 90 days from the first day of excavation/generation for hazardous waste and 120 days for non-hazardous waste.

C. All surplus excavated material shall be stored in a secure manner to prevent exposure to humans and the environment.

D. The stockpiling or consolidating of surplus excavated material near sensitive human health receptors such as public and private water supply wells or sensitive environmental receptors such as wetlands, surface water bodies, or marine environments shall be prohibited.

E. Disposal of material that is contaminated as a result of careless handling or use of unauthorized procedures shall be disposed of off-Site at the Contractors expense. Delays of Work resulting from temporary storage of surplus excavated material, regardless of the classification, shall be at no additional cost to the Owner.

F. Surplus excavated material shall be disposed/recycled off-Site per this Section within 90-days of initial excavation.

G. The Contractor shall segregate surplus excavated material into stockpiles no greater than 250-cubic yards. The Contractor shall collect the necessary samples of stockpile material at that time for classification and after giving Engineer at least two (2) days' notice of sampling. After the initial classification of the stockpile, the Engineer may require the Contractor to segregate stockpiled surplus excavated material into smaller, separate stockpiles for additional sampling to further classify the surplus excavated material.

H. The stockpiles shall be clearly labeled and securely barricaded from contact by workers and the general public.

3.4 EXCAVATED MATERIAL CATEGORIES:

Excavated material shall be categorized and managed as described as follows:

I. Native Material: Native materials are defined as beyond the tree line as depicted on Drawing Sheet C101 and in other areas of the Project beneath fill material or where fill material does not exist. These non-impacted materials may be reused on site as backfill where applicable and in accordance with Section 31 00 00 – EARTHWORK or transported off-Site for proper recycling/disposal at no additional cost to the Owner.

1. Native Material shall be removed and transported for reuse/disposal offsite in accordance with all local, state, and federal regulations and the requirements of this Section.

2. The Contractor shall handle and transport Native Material using a Material Shipping Record (MSR).

3. Contractor shall remove rubble, metal, wood, plastic, and other debris materials from Native Material as necessary, via screening or other suitable means and methods to meet acceptance criteria for the selected and approved disposal/ re-use facility. Dispose of screened/removed solid waste debris material in accordance with all applicable local, state, and federal regulations.

J. Group A - Non-impacted Soil: Group A soils are defined as fill soil with constituent concentrations less than MCP Reportable Concentrations (RCs) category RCS-1. Group A soil may be reused on site as backfill where applicable and in accordance with Section 31 00 00 – EARTHWORK or transported off-Site for proper recycling/disposal at no additional cost to the Owner.

   1. Group A material shall be transported for reuse/disposal/recycling offsite in accordance with all local, state, and federal regulations and the requirements of this Section.

   2. Reuse/disposal locations for Group A soil must be approved by the Owner/Engineer prior to soil removal.

   3. Group A surplus excavated materials identified/approved by the Engineer for reuse off-site must be done so in accordance with Massachusetts DEP's Similar Soils Provision Guidance (WSC-13-500) and all relevant Federal, State and local regulations and approvals.

   4. Contractor shall note only reuse facilities with a written Soil Management Plan and operating in compliance with an approved Administrative Consent Order (ACO) issued from DEP will be permitted for use during the work of this Contract.

   5. Contractor shall remove rubble, metal, wood, plastic, and other debris materials in soils as necessary, via screening or other suitable means and to meet acceptance criteria for the selected re-use facility. Dispose of screened/removed solid waste debris material in accordance with all applicable local, state, and federal regulations.

K. Group B - Impacted Soils: Group B soils are defined as impacted soil with constituent concentrations equal to or greater than MCP Reportable Concentrations (RCs) category RCS-1 and meeting the criteria for disposal/recycling at in-state unlined/lined landfill, out-of-state landfill, recycling, or thermal desorption facility at no additional cost to the Owner.

1. Group B material shall be transported for off-site reuse/disposal/recycling in accordance with all local, state, and federal regulations and the requirements of this Section.

2. The Contractor shall handle and transport Group B material using a Bill of Lading (BOL). The Contractor shall submit the names and addresses of the proposed recycling/disposal facilities, as required by the EMMP, to the Engineer and Owner for review and approval prior to transportation of Group B material.

3. Group B material shipped to a reuse/disposal/recycling facility must meet the selected facility's chemical and physical acceptance criteria. Selected facilities must be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, State, and Federal regulations.

4. Group B excavated material that meets the Massachusetts solid and hazardous waste regulations and the receiving facility's operating permit(s) may be used for daily cover, intermediate cover, and pre-cap contouring material.

5. Group B excavated material that meets the Massachusetts criteria for recycling or thermal desorption and the receiving facility's operating permit(s) may be transported to the selected facility given the selected facility must be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, State, and Federal regulations.

6. Group B excavated material that meets the criteria for out-of-state landfilling, recycling or thermal desorption, and meets the receiving facility's operating permit(s) may be transported to the selected facility given the selected facility must be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, State, and Federal regulations.

7. Remove rubble, metal, wood, plastic, and other debris materials as necessary, via screening or other suitable means and methods, to meet acceptance criteria for the selected facility. Dispose of screened/removed solid waste debris material in accordance with these Specifications and all applicable local, state, and federal regulations.

3.5 WEIGHT AND MEASUREMENT:

A. Native Material and Group A Non-impacted Soil is to be removed at no additional cost to the Owner and is not required to be measured by weight.

B. Group B- Impacted Soil material shall be measured by weight (tons).

C. The tare and gross weight for every vehicle, container, and trailer transporting soil and/or debris for off-Site reuse, recycling, treatment or disposal shall be measured to determine the net weight.

D. The Contractor shall provide certified tare and gross weight slips for each load received at the accepted facility and these shall be attached to each returned Massachusetts manifests or Bill of Ladings within 21 days of obtaining final signatures.

3.6 WASTE PROFILES AND MANIFESTS:

A. The Contractor shall prepare and submit to the Engineer for review all waste profile applications and questionnaires, and coordinate with disposal facilities and all Federal and State Environmental Agencies.

B. The Contractor shall prepare all Bills of Ladings, and Material Shipping Records with all applicable analytical backup, notification, and control forms. Final copies of Bills of Ladings and Material Shipping Records shall be signed by the Owner as generator and by the Engineer as LSP of record following submissions and approvals of draft Bills of Lading.

C. The Contractor shall also provide certified tare and gross weight slips for each load received at the designated facility which shall be attached to each returned Massachusetts manifests or Bill of Lading and Material Shipping Record within 21 days of obtaining final signatures.

D. The Owner will be designated as generator and will sign all manifests, Bill of Ladings, Material Shipping Records, and waste profile application or questionnaires.

E. The Contractor shall submit to the Engineer, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility(ies). The documentation shall include the following, as a minimum.

1. Documentation shall be provided for each load from the Site to the disposal facility, including all manifests and any other transfer documentation as applicable.

2. All documentation for each load shall be tracked by the original manifest document number that was assigned by the Engineer at the Site.

3. All ORIGINAL signatures (including signatures of Owner and disposal facility's representative) associated with shipment of any material from the Site under a Massachusetts Bill of Lading and/or Material Shipping Record within 21 days of

obtaining the final signatures.

3.7 TRANSPORT OF SURPLUS EXCAVATED MATERIAL:

A. The Contractor shall not be permitted to transport surplus excavated materials off-site until all applicable disposal, or recycling facility documentation has been received, reviewed, and approved by the Engineer. The Contractor shall transport the surplus excavated material under a Massachusetts Bill of Lading, Material Shipping Record, or Hazardous Waste Manifest and the requirements of this Section.

B. The Contractor shall take all precautions and any actions necessary, at no additional cost to the Owner, to prevent cross-contamination from transport vehicles to areas outside the site. The Contractor shall decontaminate equipment and vehicles as specified in Section 01 35 29 – HEALTH AND SAFETY PLAN.

C. The Contractor shall transport surplus excavated materials from the Site to the storage, disposal, reuse of recycling facility or off-Site reuse location in accordance with all United States Department of Transportation (DOT), USEPA, MADEP, and applicable State and local regulations.

D. The Hauler(s) shall be licensed in all states affected by transport.

E. The Contractor shall be responsible for ensuring that free liquid is properly transported. “Wet soils” shall not be loaded for transport. The Contractor shall dewater “wet soils”, and properly dispose of free liquid in accordance with local, State, and Federal regulations and at no additional cost to the Owner. The Contractor shall also dispose of any free liquids that may result during transportation in accordance with local, State, and Federal regulations and at no additional cost to the Owner.

F. Temporary stockpiled surplus excavated material must be removed from the Site within 90 days; however, no later than the completion date of this Contract as may be extended.

G. Transporters shall submit proof of permit, license, or authorization to transport surplus excavated material, when applicable, in all affected states.

H. A LSP Opinion from the Owner’s LSP shall be required for all material shipped using a Massachusetts Bill of Lading.

I. Utilization of a Hazardous Waste Manifest shall require the use of a licensed hazardous material transporter in conformance with the Massachusetts Hazardous Material Regulations as required by 310 CMR 30.000. An LSP Opinion is not required when using a Hazardous Waste Manifest for transporting surplus excavated materials.

3.8 DISPOSAL AND RECYCLING:

A. Surplus excavated material shall be disposed of at an approved facility as specified in Paragraph 3.04 of this Section and in accordance with all Federal, State and local regulations.

B. The Contractor shall remove rubble, metal, wood, plastic, and other debris materials in soils as necessary, via screening or other suitable means and methods, to meet acceptance criteria for the selected disposal/re-use facility.

C. The Contractor shall perform analyses on surplus excavated material as necessary to fulfill any disposal testing requirements of the approved facility.

1. The Contractor shall bear all costs incurred in sampling and analyses for those tests required by the facility in excess of those specified in this Section.

2. The Contractor shall submit a copy of all sampling analyses to the Engineer within two (2) days of receipt of the laboratory report. Analytical data shall be kept confidential, distributed to the Engineer only.

D. The Contractor shall provide to the Engineer copies of all weight slips; both tare and gross, for every load weighed and disposed of at the approved facility. The slips shall be tracked by the original manifest document number that was assigned by the Engineer at the Site. The Engineer shall make progress payments after receipt of these weight slips.

3.9 LOGS, REPORTS, AND RECORDKEEPING:

A. The Contractor shall maintain daily logs and reports covering the work to be performed for this Section of the Contract. The format shall be developed by the Contractor to include daily logs, weekly reports, and a phase out report. The Contractor shall provide Engineer with copies of all logs and reports on a weekly basis in a Microsoft Excel spreadsheet format.

B. Weekly Reports shall include, at a minimum, the following:

1. A summary of the work performed during the week
2. Area (Site specific) of work being performed
3. Equipment being utilized by employees
4. Type of work performed
5. References to material shipping records, manifests, bills of lading, and waste profiles
6. Stockpile locations, sample locations, and sample identifications
7. Details and documentation of surplus excavated materials management including surplus excavated material from stockpiles to be used as backfill
8. Protective clothing being worn by employees
9. Project manager signature and date

C. Phase Out Report shall include, at a minimum, the following:

1. Summary of work performed under this Section of the Contract
2. Copies of all material shipping records, manifests, bills of lading, and waste profiles

END OF SECTION

SECTION 03 05 00 - FIELD CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section covers concrete and all related items necessary to place and finish the concrete work.

B. Concrete features required by the Engineer shall be installed in accordance with the details shown on the drawings and as specified in this section.

C. Concrete encasement for piping with shallow cover and for encasement of telephone and electrical duct bank, when specified, shall be installed in accordance with the details shown on the drawings and as specified in this section.

1.2 RELATED WORK

A. Section 31 00 00, EARTHWORK

1.3 REFERENCES

A. The following standards form a part of this specification:

American Concrete Institute (ACI)

ACI 304	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
ACI 305	Recommended Practice for Hot Weather Concreting
ACI 306	Recommended Practice for Cold Weather Concreting
ACI SP-66 ACI	Detailing Manual
ACI 318	Building Code Requirements for Reinforced Concrete

American Society for Testing and Materials (ASTM)

ASTM A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C33	Concrete Aggregates
ASTM C94	Ready-Mixed Concrete
ASTM C143	Test for Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C260	Air Entraining Admixtures for Concrete
ASTM C494	Chemical Admixtures for Concrete

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING

Statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

PART 2 - PRODUCTS

2.1 CONCRETE

A. All concrete, reinforced or non-reinforced, shall have a 28-day minimum compressive strength of 3000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.

B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.

C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Engineer.

D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.2 REINFORCING

Reinforcing as shown on the plans or as required by the Engineer, shall conform to ACI 318 and ASTM A615 and shall be detailed in accordance with ACI SP-66. All Steel reinforcing bars shall be grade 60.

2.3 CEMENT

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.4 AGGREGATES

A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.

B. Maximum size aggregate shall be 3/4-inch.

2.5 ADMIXTURES

A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.

B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.

C. Water reducing agent shall be WRDA, as manufactured by W.R Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

D. Water reducing agent-retarder shall be "Daratard," as manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.6 WATER

A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.7 CONCRETE FORMS

A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.

B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.

C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.

D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete

PART 3 - EXECUTION

3.1 PREPARATION

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.

B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.

C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

3.2 THRUST AND ANCHOR BLOCKS

A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.

B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

3.3 FILL CONCRETE

A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.

B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set.

C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.4 CONCRETE PLACING DURING COLD WEATHER

A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40ºF, or is expected to fall to below 40ºF, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

3.5 CONCRETE PLACING DURING HOT WEATHER

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing, shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (90ºF or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90ºF, when ready for placement, will not be acceptable, and will be rejected.

3.6 FIELD QUALITY CONTROL

A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.

C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

END OF SECTION 03 05 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 -GENERAL

1.1 GENERAL PROVISIONS:

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK:

A. Work Included: This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:

1. Footings
2. Foundation walls & piers
3. Anchor Rods
4. Grout

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 01 45 23, STRUCTURAL TESTS AND INSPECTIONS
2. Section 13 34 43, FRAME SUPPORTED MEMBRANE STRUCTURES
3. Division 31, EARTHWORK; Excavation and establishment of subgrade elevations.

1.3 SUBMITTALS:

A. Refer to Section 01 33 23, SUBMITTALS for submittal provisions and procedures.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, water-stops, joint systems, curing compounds, dry-shake finish materials, anchor rods, and others if requested by the Engineer or SER.

C. Shop drawings for reinforcement detailing, fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures”. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing and supports for concrete.

D. Submit shop drawings for all formwork for Architecturally Exposed Concrete (Concrete Exposed to View) showing cone tie patterns.

E. Concrete mix design for each mix specified. Supporting test data shall be submitted if requested.

1. Submit alternate mix designs when the characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
2. Indicate the amounts of mixing water to be withheld for later addition at the Project site.

F. Proposed method of curing and associated products.

G. Proposed precautions for hot weather and cold weather concreting.

H. Samples: For waterstops.

1. Submit samples of materials as requested by the Engineer or SER, including names, sources, and descriptions.

I. Laboratory test reports for concrete materials and mix design test.

J. Material test reports for the following, from a qualified testing agency, indicating compliance with specification requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

K. Material certificates for each of the following, signed by the manufacturers:

1. Cementitious material.
2. Admixtures
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Non-metallic shrinkage resistant grout.
6. Anchor Rods.
7. Curing compounds.
8. Bonding agents.
9. Adhesives.
10. Repair materials.

L. Qualification Data: For Installer and Manufacturer.

M. Minutes of pre-installation conference.

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: A qualified installer who employs on the Project personnel qualified as ACI certified Flatwork Technician and Finisher and a supervisor who is an ACI certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mix concrete products that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency for Mix Design Qualifications: An independent agency, registered in the Commonwealth of Massachusetts as an approved testing agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician – Grade 1. The Testing Agency Laboratory supervisor shall be an ACI certified Concrete Laboratory Testing Technician – Grade II.

D. Source Limitations: Obtain each type of class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications:

1. Comply with the following unless modified by requirements in the Contract Documents:
    a. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."
    b. ACI 211.1, "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete."
    c. ACI 214, "Evaluation of Strength Test Results of Concrete."

    d. ACI 301, "Specification for Structural Concrete."
    e. ACI 304, "Guide for Measuring, Mixing, Transporting and Placing Concrete."
    f. ACI 305, "Hot Weather Concreting."
    g. ACI 306, "Cold Weather Concreting."
    h. ACI 308, "Guide to Curing Concrete."
    i. ACI 309, "Guide for Consolidation of Concrete."
    j. ACI 311.1, "ACI Manual of Concrete Inspection."
    k. ACI 315, "Details and Detailing of Concrete Reinforcement."
    l. ACI 318, "Building Code Requirements for Structural Concrete and Commentary."
    m. ACI 347, "Guide for Formwork for Concrete."
    n. ACI 350, "Code Requirements for Environmental Engineering Concrete Structures"
2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract.

F. American Society for Testing and Materials (ASTM):

1. ASTM C309 "Liquid Membrane-Forming Compounds for Curing Concrete."
2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete."
3. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete."

G. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M194 "Chemical Admixtures."

H. Pre-installation Conference: Conduct a conference at the Project site

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend including the following:
    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete subcontractor.
    e. Structural Engineer.

   f. Independent testing agency responsible for field testing.
   g. Owner's Authorized Representative.
   h. Engineer.

2. Review inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint filler strips, semi-rigid joint fillers, forms and form removal limitations, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor slab and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 -PRODUCTS

2.1 FORM-FACING MATERIALS:

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

   1. Plywood, metal, or other approved panel materials.
   2. Formwork for elements exposed to view, including, but not limited to knee walls, above grade piers, and exposed faces of retaining walls, shall conform to Surface Finish 3.0 per ACI 301.

B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, ¾-inch by ¾-inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable, or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral earth pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

G. Furnish units that will leave no corrodible metal closer than 1-inch to the plane of exposed concrete surface.

H. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

1. Provide reinforcing bars conforming to ASTM A706, Grade 60, deformed, if welding is required.

B. Plain Steel Wire: ASTM A 82, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

D. Reinforcing at the Salt Shed shall be epoxy coated per ASTM A 775 and ASTM A 934.

2.3 NON-METALLIC SHRINKAGE RESISTANT GROUT:

A. Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time. The minimum ultimate compressive strength of the grout shall be 5000 psi at 7 days and 7500 psi at 28 days.

2.4 REINFORCEMENT ACCESSORIES:

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolster, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice", of greater of compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless steel bar supports.
2. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Concrete bricks may be used to support reinforcing steel where application allows.

2.5 ANCHOR RODS

A. Anchor Rods: ASTM F 1554, Grade 55 (Weldable), Hot Dipped Galvanized per ASTM A 153. Headed type unless otherwise noted. Provide suitable nuts in accordance with ASTM F1554 and ASTM A563 and washers in accordance with ASTM F436. Nuts and washers shall be hot-dipped galvanized.

B. Anchor rod required diameters are as specified by the Prefabricated Membrane Structure Manufacturer and approved by the Engineer. Embedment depths are as specified by the Engineer.

2.6 CONCRETE MATERIALS:

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout the Project:

1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:

B. Fly Ash: ASTM C 618, Class C or F.

C. Ground Granulated Blast Furnace Slag: ASTM C 989, Grade 100 or 120.

D. Cementitious Materials: Percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash or Ground Granulated Blast Furnace Slag: 25 percent, minimum.
2. Combined Fly Ash and Pozzolan: 35 percent, maximum.
3. Ground Granulated Blast Furnace Slag: 50 percent, maximum.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast Furnace Slag: 50 percent Portland cement minimum, with fly ash or pozzolan not exceeding 35 percent.

E. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse Aggregate Size: ¾-inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

F. Water: ASTM C 94 and potable.

2.7 ADMIXTURES:

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor, capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C.

1. Products:
    a. Euclid Chemical Company; Eucon CIA.
    b. Grace Construction Products; DCI.
    c. Master Builders Solutions (MBS); MasterLife Cl 30.
    d. Sika ; Sika CNI.
    e. Or approved equal.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products:
    a. Grace Construction Products; DCI-S.
    b. Sika AG: Sika FerroGard 903

   c. Euclid Chemical: Eucon BCN
   d. Or approved equal.

E. Integral Crystalline Waterproofing Admixture: Commercially formulated; integral powdered crystalline admixture; complying with ASTM C 494 Type S; must be NSF/ANSI Standard 61 certified for use in structures containing potable water. Incorporate into concrete mix design per the manufacturer's recommendations.

1. Products:
   a. Penetron International Ltd; Penetron Admix.
   b. Xypex; Xypex Admix C-500.
   c. Sika Corporation: Sika WT-240 P
   d. Aquafin Inc; Aquafin-IC Admix.
   e. Or approved equal.

2.8 CURING MATERIALS:

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. /sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor coverings.

1. Products:
   a.
   b. Dayton Superior Corporation; Cure & Seal 309J-18.
   c. Euclid Chemical Company; Diamond Clear VOX.
   d. Lambert Corporation; Crystal Clear Seal WB.
   e. Laticrete, Inc.; Dress & Seal WB.
   f. Meadows, W.R., Inc.; Vocomp-20.
   g. Nox-Crete Products Group; Cure & Seal 100E.
   h. Or approved equal.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products:
    a. Dayton Superior Company; Cure & Seal 1315 J22WB.
    b. Euclid Chemical Company; Super Diamond Clear VOX.
    c. Lambert Corporation; Crystal Clear Seal 1315 WB.
    d. Meadows, W.R., Inc.; Vocomp-30.
    e. Or approved equal.

2.9 RELATED MATERIALS:

A. Expansion and Isolation Joint Filler Strips: ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336-inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS:

A. Repair Underlayment: Cement based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8-inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8-inch to ¼-inch or coarse sand as recommended by the underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C 109.

B. Repair Overlayment: Cement based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8-inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8-inch to ¼-inch or coarse sand as recommended by the topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C 109.

2.11 CONCRETE MIXTURES, GENERAL:

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer’s written instructions.

1. Use water-reducing, high-range water reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water cementitious materials ratio below 0.50 or as specified.
4. Use retarding admixture in combination with Set accelerating Corrosion Inhibitor. Retarder is not required for non-set accelerating corrosion inhibitor.
5. Use corrosion inhibiting admixture in concrete mixtures where indicated.
6. Use moisture vapor reduction admixture on all slabs to receive floor finishes. Refer to Specification Section 03 05 10.
7. Use integral crystalline waterproofing admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS:

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45
3. Slump Limit: 4-inches, plus or minus 1-inch, prior to adding high-range water-reducing admixture or plasticizing admixture, maximum slump with admixture is 6 inches
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Corrosion Inhibiting Admixture: Apply to walls and piers at a rate of 2 gallons per cubic yard of concrete.

B. Foundation Walls and Piers: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45
3. Slump Limit: 4-inches, plus or minus 1-inch, prior to adding high-range water-reducing admixture or plasticizing admixture, maximum slump with admixture is 6 inches
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Corrosion Inhibiting Admixture: Apply to walls and piers at a rate of 2 gallons per cubic yard of concrete.

2.13 FABRICATING REINFORCEMENT:

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice".

2.14 CONCRETE MIXING:

A. Ready-Mix Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.

B. When air temperature is between 85- and 90-degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL:

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing.

3.2 FORMWORK:

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. For elements exposed to view, conform to Surface Tolerance A.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8-inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspections ports where interior area formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer’s written instructions, before placing reinforcement.

3.3 EMBEDDED ITEMS:

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC’s “Code of Standard Practice for Steel Buildings and Bridges”.
    a. Anchor rods shall be installed as specified by the Prefabricated Membrane Structure Manufacturer and as approved by the Engineer.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting type screeds.

3.4 REMOVING AND REUSING FORMS:

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form removal operations and curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Engineer.

3.5 STEEL REINFORCEMENT:

A. General: Comply with CRSI’s “Manual of Standard Practice” for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire ties.

3.6 JOINTS:

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or approved by the Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs unless noted otherwise.
2. Form keyed joints as indicated. Provide embed keys at least 1-1/2-inches into concrete and 3-1/2” wide unless noted otherwise.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at the underside of floors, slabs, beams, and girders and at the top of footings and floor slabs.
5. Space vertical joints in walls at 60-feet on center maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Where fresh concrete is placed against hardened concrete, roughen hardened concrete surfaces to 1/4 – inch amplitude, thoroughly clean concrete surface, and dampen surface to saturated surface dry condition.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces where indicated or specified.

3.7 CONCRETE PLACEMENT:

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6-inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 degrees F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, providing water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor’s option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing of concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES:

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to view.

B. Smooth-Formed Finish: Provide Surface Finish 3.0 per ACI 301 and Surface Tolerance Class A per ACI 117. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with minimum number of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to view including but not limited to knee walls, above grade piers, and exposed faces of retaining walls.
2. Mock-up of concrete surface appearance is not required.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth level finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 MISCELLANEOUS CONCRETE ITEMS:

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CONCRETE PROTECTING AND CURING:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Curing all slabs in the project with moisture curing. Keep surfaces continually moist for not less than seven days with the following materials:
    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in the widest practicable width, with sides and ends lapped at least 12-inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    a. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer’s written instructions. Recoat areas subject to heavy rainfall within three hours after initial applications. Maintain continuity of coating and repair damage during curing period.
    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer’s written instructions. Recoat areas subject to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply second coat. Maintain continuity of coating and repair damage during curing period.

D. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.11 CONCRETE SURFACE REPAIRS:

A. Defective Concrete: repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to the Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½-inch in any dimension in solid concrete, but not less than 1-inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush coat holes and voids with bonding agent. Fill and compact patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14-days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Repair defective areas, except random cracks and single holes 1-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least ¾-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair random cracks and single holes 1-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72-hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to the Engineer's approval.

3.12 FIELD QUALITY CONTROL:

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample of each day's pour of each concrete mixture exceeding 5 cubic yards, but less than 25 cubic yards, plus one set for each additional 50 cubic yards or fraction thereof.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each composite sample.
5. Density of Freshly Mixed Concrete: ASTM C 138; for calculating unit weight. Perform test when placing lightweight concrete mixes.
6. Compression Test Specimens: ASTM C 31.
7. Cast and laboratory cure five (minimum) standard cylinder specimens for each composite sample.
8. Compressive Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and one set of three specimens at 28 days. Test remaining specimen at 28 days if previous results are satisfactory or retain this specimen for 56 day testing if results are not satisfactory.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive strength tests equals or exceeds specified compressive strength and no compressive strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to the Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28 day tests.

1. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection of concrete.
2. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as required by the Engineer. Testing and inspecting agency may conduct tests to determine

adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as required by the Engineer.

3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
4. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

3.13 GROUTING:

A. Mix grout in accordance with the approved manufacturer's instructions to a consistency which will permit placement. Place grout so as to ensure complete bearing and elimination of air pockets.

END OF SECTION 03 30 00

SECTION 03 48 46 - PRECAST CONCRETE BLOCK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section includes design, furnishing and installation of precast concrete block segments for use in construction of a new stepped block storage bin system as shown on the drawings and as required by the Engineer.

B. The Contractor shall furnish all labor, materials, tools and equipment and shall perform all work to satisfactorily install the precast concrete blocks. The work shall include installation and assembling of the precast block segments as shown on the plans.

1.2 RELATED WORK

A. Section 31 00 00, EARTHWORK

1.3 QUALITY ASSURANCE

A. The block segments shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all design requirements of the precast units.

B. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Inspection may be made at the place of manufacture, on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if they fail to meet any of the specification requirements. Any sections which are rejected shall be immediately removed from the job site by the Contractor.

1.4 REFERENCES

A. The following standards form a part of this specification, as referenced:

	American Society for Testing and Materials (ASTM)	
ASTM	A615	Deformed Billet Steel Bars for Concrete Reinforcement
	American Concrete Institute (ACI)	
ACI	318	Building Code Requirements for Reinforced Concrete

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS SUBMIT THE FOLLOWING

A. Six (6) sets of manufacturers literature and shop drawings of the materials of this section shall be submitted to the Engineer for review. As required by Section 00 72 00 GENERAL CONDITIONS and before fabrication of the precast blocks is begun, the Contractor shall submit shop drawings for review of the overall concept showing the size, interlocking key system, reinforcement, openings and beveled edges, in complete accordance with the requirements given on the drawings and in the specifications. The Contractor and his supplier are responsible for the structural integrity of the precast block sections. The design shall be prepared and stamped by a professional structural or civil engineer registered in the state of Massachusetts.

B. The Contractor shall also submit to the Engineer a detailed written description of the method he proposes to use to accomplish the block wall installation.

C. Test reports as required shall be submitted to the Engineer.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Each block shall have rough dimensions 2-feet x 2-feet x 4-feet long and be formed with an interlocking key system consisting of a minimum of three (3) tapered knobs with minimum dimensions of 2-5/8-inches high and 7-5/8-inches diameter. Blocks shall have beveled edges and shall have openings on the bottom sized to interlock with knobs of other blocks when stacked. Blocks shall contain reinforcement as recommended by the manufacturer.

B. Precast sections shall be designed to withstand material loads against each unit, forces associated with tension membrane structure connections, and impacts from front end loaders.

2.2 PRECAST CONCRETE SECTIONS

A. Minimum compressive strength of concrete shall be 5,000 psi at 28 days.

B. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each block.

C. The Engineer reserves the right to reject any precast section and the rejected unit shall be tagged and removed from the job site immediately. The Engineer may also require testing of the concrete, with the Contractor bearing all testing costs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All precast sections shall be installed in strict accordance with the shop drawings and the manufacturer's recommendations. The sections shall be carefully placed on the prepared bedding in such manner and by such means as is required to properly control the final positioning.

B. The blocks shall be installed to the lines and grades indicated on the drawings.

C. The precast reinforced concrete sections shall be set so as to be in true vertical and horizontal alignment.

END OF SECTION 03 48 46

SECTION 07 00 01- WATERPROOFING, DAMPPROOFING AND CAULKING FILED SUB-BID REQUIREMENTS (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Work of this Section requires Filed Sub-bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.

C. Specification requirements for the filed sub-bid "Waterproofing, dampproofing, and caulking" include all of the following listed Specification Sections: in their entirety:

1. ***Section 07 13 53 - MEMBRANE WATERPROOFING***
2. ***Section 07 92 00 – JOINT SEALANTS***

D. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings, not just those pertaining particularly to this Sub-Trade, unless specifically called out otherwise, regardless of where among the Drawings it appears:

General: G001

Civil: C001, C201, C301, C302, C401, C501, C601, C602, C603

Structural: SPW1001, SPW1101, SPW1201, SPW1301, SPW1302, SPW1901

Architectural: APW1101, APW1102

Equipment: EQ201, EQ202, EQ203

Electrical: E0.01, SU1.00, ELP1.00, E2.02, E6.10

E. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract.

F. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in INVITATION TO BID and INSTRUCTION TO BIDDERS.

1. The following shall appear on the upper left hand corner of the envelope:
2.

NAME OF SUB-BIDDER:	______________________
SUB-BID FOR TRADE:	WATERPROOFING, DAMPPROOFING, & CAULKING

3. Each sub-bid submittal for work under this Section shall be on forms furnished by Awarding Authority, as bound herein, accompanied with the required bid deposit.

G. Sub-Sub Bid Requirements: NONE REQUIRED UNDER THIS SECTION.

1.2 EXAMINATION OF SITE AND DOCUMENTS

A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed-Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

1.3 SEQUENCING

A. Coordinate work of this Filed-Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.

B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed-Subcontract, have been received and approved by the Engineer.

C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Engineer in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

PART 2 - PRODUCTS

2.1 SCAFFOLDS AND STAGING

A. General: Filed Sub-contractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 52 13 - TEMPORARY FACILITIES and herein.

1. Scaffolding and staging required for use by this Filed Sub-contractor pursuant to requirements of Section 01 52 13 - TEMPORARY FACILITIES shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-trade requiring such scaffolding.
2. Each Filed Sub-contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 52 13 - TEMPORARY FACILITIES and as additionally required for dust control).
3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Filed Sub-contractor.
4. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each workday to prohibit access to the scaffolding by unauthorized individuals.

2.2 HOISTING MACHINERY AND EQUIPMENT

A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed-Sub Contractor shall be furnished, installed, operated and maintained in safe conditions by this Filed-Sub Contractor, as referenced under Section 01 52 13 - TEMPORARY FACILITIES.

PART 3 - EXECUTION

3.1 DAILY CLEANUP

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

END OF SECTION 07 00 01

SECTION 07 13 53 – MEMBRANE WATERPROOFING
(FILED SUB-BID REQUIRED AS PART OF SECTION 07 00 01)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing of labor, materials, equipment and incidentals for the application of the membrane waterproofing system complete as shown in the Drawings and specified herein. The waterproofing system shall be applied to the outside of the concrete foundation walls from 6-inches below grade down to the top of the building foundation mat.

1.02 RELATED WORK:

A. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM)

ASTM D412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D624	Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D2581	Polybutylene (PB) Plastics Molding and Extrusion Materials

B. Where reference is made to one of the above standards, the revisions in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE:

A. All materials required for the installation shall be furnished by a single manufacturer who has been actively marketing a self-adhesive modified bituminous sheet waterproofing system in the United States for a minimum of 10 years.

B. A full-time employee of the membrane manufacturer who is trained in the application of the specified system shall be available for consultation and periodic job visits.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

D. Use a subcontractor currently approved in writing by the manufacturer of the approved waterproofing.

E. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change is not considered a structural failure.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Materials list of items proposed to be provided under this Section;

B. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;

C. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.

2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage, and protection.

PART 2 - PRODUCTS

2.01 MEMBRANE WATERPROOFING:

A. Where indicated on the Drawings, and described herein provide Bituthene 4000" manufactured by W.R. Grace Co., or provide an equal system approved by the Engineer.

B. For protection of the installed membrane waterproofing, provide Bituthene Protection System consisting of Bituthene protection board PB-3000 adhered with Bituthene protection board adhesive PBA-000 applied at a rate of 250 to 350 sq. ft. per gal., or an approved equal.

2.02 OTHER MATERIALS:

Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 SUBSTRATE INSPECTION AND PREPARATIONS:

A. All concrete shall be properly cured and dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete).

B. All surfaces to receive waterproofing shall be structurally sound and free of voids, spalled areas, loose aggregate, sharp protrusions, coarse aggregate, grease, oil, wax, dust, dirt, and debris, as described by the manufacturer.

3.02 MEMBRANE INSTALLATION:

A. Apply surface conditioner recommended for the membrane to the concrete surface in accordance with manufacturer’s directions and let it dry thoroughly, as specified.

B. Apply the membrane to the prepared surfaces in accordance with manufacturer’s directions, with special attention to corners, laps and edges. Do not apply when ambient or surface temperatures are below 25ºF.

C. Apply manufacturer recommended hardboard over the membrane with recommended adhesive, per manufacturer’s instructions.

D. Backfill around foundation walls, exercising care to avoid damage to the protective board on the membrane. See Section 31 00 00, EARTHWORK, for backfill materials and procedures.

END OF SECTION 07 13 53

SECTION 07 92 00 - JOINT SEALANTS
(FILED SUB-BID REQUIRED AS PART OF SECTION 07 00 01)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Mildew-resistant joint sealants.
6. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction laboratory test reports.

C. Preconstruction field-adhesion-test reports.

D. Field-adhesion-test reports.

E. Sample warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

   1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
   3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with masonry substrates.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Colors of Exposed Joint Sealant As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. GE Construction Sealants; Momentive Performance Materials Inc.

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. GE Construction Sealants; Momentive Performance Materials Inc.
   b. Pecora Corporation.
   c. Sika Corporation; Joint Sealants.

C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. GE Construction Sealants; Momentive Performance Materials Inc.
   b. The Dow Chemical Company.

D. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. GE Construction Sealants; Momentive Performance Materials Inc.
   b. Pecora Corporation.
   c. The Dow Chemical Company.

E. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Pecora Corporation.

   b. Sika Corporation; Joint Sealants.
   c. The Dow Chemical Company.

F. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Soudal USA.
      b. The Dow Chemical Company.

G. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. May National Associates, Inc.; a subsidiary of Sika Corporation.
      b. Pecora Corporation.
      c. Sika Corporation; Joint Sealants.

H. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 100/50, Uses T and NT.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. May National Associates, Inc.; a subsidiary of Sika Corporation.
      b. Pecora Corporation.
      c. Sika Corporation; Joint Sealants.

I. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

   1. Manufacturers: Subject to compliance with requirements, provide products by the following:

      a. May National Associates, Inc.; a subsidiary of Sika Corporation.

J. Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade P, Class 100/50, Uses T and NT.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   - a. May National Associates, Inc.; a subsidiary of Sika Corporation.
   - b. Sika Corporation; Joint Sealants.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   - a. Pecora Corporation.
   - b. Sika Corporation; Joint Sealants.
   - c. Tremco Incorporated.

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   - a. Pecora Corporation.
   - b. Sika Corporation; Joint Sealants.
   - c. The Dow Chemical Company.

D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   - a. The Dow Chemical Company.

E. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   - a. Tremco Incorporated.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Pecora Corporation.
    b. Sika Corporation; Joint Sealants.
    c. Tremco Incorporated.

B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Sika Corporation; Joint Sealants.

C. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BASF Corporation.
    b. LymTal International Inc.

D. Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 35, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Bostik, Inc.

E. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BASF Corporation.
    b. Pecora Corporation.
    c. Permathane®/Acryl-R®; ITW Polymers Sealants North America.

F. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Pecora Corporation.

G. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BASF Corporation.
    b. Sherwin-Williams Company (The).

H. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Tremco Incorporated.

I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BASF Corporation.
    b. Pecora Corporation.
    c. Sika Corporation; Joint Sealants.

J. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. LymTal International Inc.

K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation.
b. Pecora Corporation.
c. Sika Corporation; Joint Sealants.

2.5 IMMERSIBLE JOINT SEALANTS

A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C1247, Class 1, tested in deionized water unless otherwise indicated

B. Urethane, Immersible, S, NS, 100/50, NT, I: Immersible, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses NT, and I.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Tremco Incorporated.

C. Urethane, Immersible, S, NS, 35, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT and I.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. BASF Corporation.

D. Urethane, Immersible, S, NS, 50, T, NT, I: Immersible, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T, NT, and I.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Tremco Incorporated.

E. Urethane, Immersible, S, NS, 35, T, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 35, Uses T, NT, and I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation.
b. Sika Corporation; Joint Sealants.

F. Urethane, Immersible, S, NS, 25, T, NT, I: Immersible, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T, NT, and I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        a. BASF Corporation.
        b. Pecora Corporation.
        c. Tremco Incorporated.

G. Urethane, Immersible, S, P, 50, T, NT, I: Immersible, single-component, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 50, Uses T, NT, and I.

    1. Manufacturers: Subject to compliance with requirements, provide products by the following:

        a. Tremco Incorporated.

H. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T, NT, and I.

    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        a. Sika Corporation; Joint Sealants.
        b. Tremco Incorporated.
        c. W.R. Meadows, Inc.

I. Urethane, Immersible, M, NS, 50, T, NT, I: Immersible, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T, NT, and I.

    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        a. LymTal International Inc.
        b. Tremco Incorporated.

J. Urethane, Immersible, M, NS, 25, T, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T, NT, and I.

    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        a. BASF Corporation.
        b. Sika Corporation; Joint Sealants.

K. Urethane, Immersible, M, P, 25, T, NT, I: Immersible, multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T, NT, and I.

    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. BASF Corporation.
   b. LymTal International Inc.
   c. Sika Corporation; Joint Sealants.

2.6 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Pecora Corporation.
   b. The Dow Chemical Company.
   c. Tremco Incorporated.

C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Pecora Corporation.
   b. Sherwin-Williams Company (The).
   c. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Alcot Plastics Ltd.
   b. BASF Corporation.
   c. Construction Foam Products; a division of Nomaco, Inc.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with ASTM C1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces: JS-A.

1. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Joints between plant-precast architectural concrete paving units.
    c. Tile control and expansion joints.
    d. Joints between different materials listed above.
    e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, P, 50, T, NT
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion: JS-B

1. Joint Locations:
    a. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces: JS- C

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces: JS-D

1. Joint Locations:

   a. Isolation joints in cast-in-place concrete slabs.
   b. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces: JS-E.

1. Joint Locations:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Tile control and expansion joints.
   c. Vertical joints on exposed surfaces of unit masonry, concrete walls and partitions.
   d. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors

F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement: JS-F.

1. Joint Locations:

   a. Control joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces: JS-G.

1. Joint Locations:

   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors

H. Joint-Sealant Application: Concealed mastics: JS-H.

1. Joint Locations:

    a. Aluminum thresholds.
    b. Sill plates.
    c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 13 34 43

FRAME SUPPORTED MEMBRANE STRUCTURE

PART 1 - GENERAL

1.1 INTENT OF SPECIFICATION

A. This specification covers the design, manufacture, shipping, handling and erection of a prefabricated membrane covered structure.

B. The specification as heretofore set forth is general in nature and scope and shall not be construed as to limit the work other than the requirement that the new re-locatable building shall match the specification in materials, appearance, configuration and details.

C. It is the intent of this specification that the bidder shall include all labor, materials, equipment services and transportation to locate the building on the site designated with all other work.

D. Buildings shall be complete and operating and shall include all exterior and interior materials and systems as shown or indicated in contract documents.

E. All workmen shall be skilled and qualified for the work that they perform. All materials used, unless otherwise specified, shall be new and of the types and grades specified. The contractor shall certify that no asbestos containing building materials that exceed Federal mandated safe asbestos levels have been used in the construction of the membrane-covered structure.

F. Related Work: The following items are related to the work of this Section and are specified elsewhere:

   a. Section 03 30 00 – Cast-In-Place Concrete
   b. Division 0 and 26 Specifications

1.2 APPROVAL OF PLANS

A. Upon award of this contract, The Contractor shall furnish detailed drawings for all structural work stamped by an engineer certified by the State of MA to verify compliance to local and state building codes. Stamp plans shall be provided for the frame supported membrane structure upon the cast-in-place concrete retaining and foundation wall assembly..

B. All work to be performed under the conditions of this specification shall comply with the rules and regulations of all agencies having jurisdiction for this classification of construction and design and shall conform to the applicable live loads due to wind, rain and snow.

C. Building supplier must provide written certification that they have been in the steel tension membrane building business for 10 years or more under the same name.

D. Building supplier must provide written references with contact information for at least three salt sheds currently in operation in the State of MA with a square footage

4000sq’ or more

1.3 WORKMANSHIP

A. The workmanship of all materials and components of the structure shall be commensurate with the functional requirements of the item.

B. Building prefabrication shall be performed under factory conditions in a plant specifically arranged for this type of work. Contractor shall provide adequate space, equipment, personnel, and technical ability to coordinate the assembly and factory prefabrication of all major components of the work and all necessary operations in the packing, shipping and installation procedures. No fabrication shall be done until the materials have been tested and approved.

C. Welding: Welding shall be employed only when specified in the original design. As per Section 1704.2 of IBC, the truss fabricator must be an Approved Welding Fabricator to AWS B5.17 and QC17.

D. On Site Welding: If welding is required on site, no welding shall be started until the AWS welding inspector has inspected and approved the materials, joint preparation, equipment and the qualifications of the welders. Welders doing unsatisfactory work will be removed and required to pass qualification tests again before returning to work.

E. Manufacturer: The structure supplier shall be a reputable manufacturer, that shall have at least 10 years direct experience in the design, manufacture and installation of structures of the type specified herein; shall operate according to a comprehensive quality system and shall provide three references with structures in use for at least five years which are clear span and each must enclose an area in excess of the square footage as stated in section 1.02 , D.

1.4 DIMENSIONS

A. Building nominal dimensions shall be as shown on the Drawings

1.5 SCOPE OF WORK

A. Rigid steel frame supporting membrane covered roof and wall structure of the type described herein:

B. The structure must provide a minimum 13’ straight side wall above the cast-in-place concrete wall. Building must provide a minimum 14’ wide by 28’ tall dumping envelope to allow salt delivery vehicles to unload inside the building.

C. Flat gable ends with (2) 3’ x 3’ passive vents on each end.

D. Provide engineered and stamped plans for building by a MA Registered PE.

1.6 WARRANTY

A. Manufacturer shall submit applicable warranties and/or certifications for the product to the Owner through the engineer. Identify available warranties and submit sample of warranties along with bid.

B. Manufacturer shall provide a 10- year minimum warranty for the fabric membrane including all attachment hardware, and a 15-year minimum warranty on the steel components of the building.

C. Include costs for above warranty and certifications in the cost of the frame supported membrane structure.

PART 2 - PRODUCTS

2.1 GENERAL DESIGN REQUIREMENTS

A. SCOPE

1. The membrane shall be tensioned over the framework. The structure shall be rectangular in shape with vertical gable end walls. The interior of the structure below the main trusses shall be clear span free of any structural support members and shall provide unobstructed floor space. No exterior purlins, guy ropes or cables shall be used for anchoring the structure.

B. DESIGN REQUIREMENTS - STRUCTURAL FRAME

1. Roof and Wall Surfaces: To provide for maximum compatibility with standard door, window, ventilation and other accessory and cladding systems, the structure shall be designed such that gable surfaces form flat planes.

2. Purlin Spacing: To provide for structural stability and to provide for installation of accessory items, the main structural trusses shall be laterally braced by load bearing purlins at intervals required by the truss design.

3. Wind and Frame Bracing: The structure shall be appropriately stabilized with wind bracing cable as well as any required secondary node restraint assemblies so as to efficiently transfer wind, snow and seismic induced stresses to the foundation/anchoring system. Cable diameter for main wind bracing shall be a minimum of 3/16” diameter and larger if so required. The end bays of the structure shall be designed to be X - braced early during installation to allow for permanent stability of the frame during installation.

4. Connecting Joints: Connections between structural elements shall be designed so as to transfer the compressive and tensile forces present in a given joint. A minimum of Grade 5 bolts shall be used at each truss chord joint. Primary axial steel, secondary purlins, and end wall frame connections shall be made with a minimum of Grade 5 hex bolts, carriage bolts and self drilling screws.

5. Mechanical Equipment Interface: The main structural roof trusses shall allow for installation of electrical and mechanical equipment based on collateral loads as defined in section 2.2.2. Likewise, the structure shall accept penetrations through the membrane for access doors and mechanical services with minimal modification.

6. Ancillary Systems: The structure shall be designed such that it can be readily retrofitted with insulation systems and other ancillary systems such as lighting, sprinklers, HVAC, provided collateral load factors are taken into account.

C. DESIGN REQUIREMENTS - MEMBRANE CLADDING SYSTEM

1. Membrane: The roof membrane shall form a weather tight shell over the structural frame. In order to provide for a good finished appearance and to insure weather tightness, the membrane shall be assembled and tensioned, in a manner to minimize wrinkles in hot and cold temperatures.
   The fabric will extend 22” past top of wall to create an eave

2. The gable wall membrane cladding shall be manufactured and connected to form one piece to the adjacent end wall and roof cladding.

3. Roof membrane horizontal stretch shall be maintained with horizontal purlins requiring no ongoing maintenance. Vertical stretch shall be maintained with a winch lock system requiring minimal ongoing maintenance.

4. Each bay shall have an individual fabric panel attached to each truss via a keder system. The keder system must include a vinyl cap to seal all extrusion.

5. Base Tensioning System: The membrane cladding will be provided with a mechanical tensioning system that allows the membrane to be fully tensioned around the structure perimeter. The system will be designed such that the membrane can be tightly and neatly secured over the structural frame and such that the system has remaining range of adjustment.

6. Membrane Seal at Openings and Base: The Dealer supplying the structure will provide all materials and methods necessary to fully tension and seal the membrane material around all door, ventilation and other openings as well as around the structure perimeter below the main tensioning system. This seal shall provide a neat and finished appearance and eliminate any loose membrane cladding that could otherwise be damaged by flapping or abrasion.

7. The membrane shall not be designed to function as a structural member such that, should any damage to or penetrations of the membrane occur, the integrity

of the structural framework shall not be affected.

8. The Contractor shall provide drawings and calculations acceptable to the Architect/Engineer of Record, meeting the provisions of the applicable State Building Code. The Contractor shall bear all costs for production of drawings and associated structural calculations. Contractor shall make all revisions and corrections to those documents required for approval and shall resubmit as required to obtain approvals.

2.2 ENGINEERED DESIGN CRITERIA

A. The structure shall be designed using methodology as per the ASCE 7 standard referenced from the applicable building code. Primary and secondary framing shall comply with current issues of AISC, AISI, NEMA and ASTM specifications, as applicable. Structural members shall be designed using Allowable Stress Design (ASD) or Load Resistance Factored Design (LRFD) for the design loads given below. Appropriate safety factors to yield and ultimate shall be maintained. Wind load factors and coefficients used in design of structural members must be in accordance with the applicable ASCE 7 guidelines. An appropriately justified analysis method which considers both the large displacement geometric and material nonlinearities of the fabric cladding shall be used in determination of the load effects on all supporting elements. Upon request use of the methodology must proven by providing a detailed calculation package. The use of Metal Building Software (MBS) is not acceptable for the aforementioned analysis.
   1. Building Occupancy Category I
      - Refer to SPW1001 drawing for loading criteria.

B. Snow Loads: The structure shall be designed based upon a minimum ground snow load of 35 pounds per square foot (Psf)At a minimum, the structure shall be capable of supporting a flat roof snow load of 30lbs pounds per square foot

C. Wind Loads: The structure shall be capable of withstanding a basic wind speed (3-second gust) from any direction of 122 miles per hour. The design wind pressure shall be based on an exposure category of C and appropriate wind load factors and coefficients in accordance with the applicable referenced ASCE 7 guidelines. In no event shall the wind load used in the design of the main wind force resisting system be less than 10 pounds per square foot multiplied by the area of the building or structure projected on a vertical plane that is normal to the wind direction (or as prescribed by the applicable building code).

D. Rainfall: The structure shall be capable of withstanding the effects of rainfall up to 4 inches per hour for at least 2 hours.

E. Deflection: For safety of specified or future suspended accessories, the maximum allowable deflection of structural members shall be no more than 1/180 of the clear span of that member when subjected to the design loads described herein.

F. Design Loads: The design shall be based as a minimum on the following design loads. Each member shall be designed to withstand stresses resulting from combinations of design loads that produce maximum percentage of actual to allowable stress in that member as per referenced ASCE 7 standards from applicable building code.

1. D= Dead Load + Collateral Load
2. S= Symmetrical Snow or Live Load (Balanced or Unbalanced)
3. Ws = Wind with internal suction
4. Wp = Wind with internal pressure
5. E = Earthquake

2.3 OPERATION AND USE

A. The main structural frame and cover shall be warranted to provide a minimum 15-year operational use period with appropriate inspection and maintenance.

B. The structure shall be capable of being assembled, operated, and dismantled in all ambient temperatures between -20°F and 120°F.

2.4 MATERIALS

A. All materials used in the structure shall be new, without defects and free of repairs.
   a. The quality of the materials used shall be such that the structure is in conformance
   b. with the performance requirements as specified herein.

B. Cladding Membrane: The structure shall be clad with High Density Polyolefin fabric manufactured by an approved and reputable supplier with demonstrated long-term performance. The polyolefin membrane fabric shall be waterproof and free from defects. All roofs, walls, end walls and connecting sections shall be weather tight. The material will be selected from the manufacturer's standard colors for the sidewalls and roof panels. The material scrim and coating must be UV stabilized, and must carry a minimum fifteen-year manufacturer's warranty and have a minimum life expectancy of 10years

RU ELITE EQUIVALENT OR BETTER

INTERTAPE POLYMER GROUP®

TECHNICAL DATA SHEET

DESCRIPTION

NovaShield® RU ELITE is a heavyweight membrane for applications extended UV stability, such as membrane structures. This ELITE product is manufactured with a high strength film laminated to one side and a proprietary coating on the back side. This high strength film is used to enhance abrasion resistance, flex resistance, seam strength, UV resistance and longevity. The scrim is produced in a special weaving pattern to enhance flatness, abrasion resistance, and tear properties.

FABRIC SPECIFICATIONS

Weave: Woven HDPE scrim Coating: White PE
Film: White PE Colour: White only
Weight: 13.5 oz/yd^2 (458g/m^2) +/- 5 %

ROLL SPECIFICATIONS

Cores: 4 inch I.D. or 5 inch I.D. available Width: 144 inches (-0, +0.5)
Length: White/white – 500 yards

PERFORMANCE PROPERTIES

The following data are typical values based on ASTM standard tests. These data should not be considered a specification.

Grab Tensile ASTM D5034	Warp 460 lb 2042 N / Weft 410 lb 1820 N
Strip Tensile (N/5cm) ASTM D5035	Warp 275 lb/in (2442)/Weft 260 lb/in (2308)
Tongue Tear ASTM D2261	Warp 85 lb 377 N / Weft 78 lb 346 N
Trapezoidal Tear ASTM D4533	Warp 90 lb 399 N / Weft 85 lb 377 N
Mullen Burst ASTM D3786	640 psi / 4409 kPa
Accelerated UV Weathering[1] ASTM G154	>90% strength retention after 2000 hrs exposure @ 0.77 $W/m^2/nm$, or 1200 hrs exposure @ 1.35 $W/m^2/nm$
Low Temperature Bend ASTM D2136	-65°C

G. The main structure shall consist of a welded truss arches with parallel tube chords separated apart by webbing. A minimum of 3" of weld shall join the web to the cord at each location. The web shall be an open section to allow access to all surface areas for hot dip galvanization. Continuous tubular webbing is not acceptable.

H. Truss sections are manufactured and post dip galvanized to insure proper protection on the inside as well as the external surfaces of the truss sections. All sections must be post dipped galvanized post fabrication to a minimum of CSA G-164 / ASTM A123-15. Truss will be manufactured of a cold-formed and induction welded modified grade carbon steel, providing a finished tubular product with exceptional mechanical and corrosion resistant properties.

I. Tolerances: All dimensional tubing tolerances are in accordance with ASTM A500, Section 10.

J. Tubing shall be manufactured using steel conforming to ASTM A568, ASTM A1011 and G40.21 350W. Finished steel tubing used in the structure must have minimum structural and mechanical properties based on standard ASTM A500.

K. All steel flat bar, cross rods and other steel components shall be fabricated from hot dipped galvanized material, meet the stated standards and have minimum structural and mechanical properties based on standard CSA G40.20/40.21-44W or ASTM A572 Grade C

L. Corrosion Protection: as per 2.4.3 all Metal sections shall be hot dipped galvanized to a minimum of CSA G-164 / ASTM A123-15. This allows for maximum protection on all welded surfaces including the interior sections.

M. Hardware:
   1. Bolts: Bolts subject to extreme stress and wear shall be structural bolts of Grade 5 and plated / galvanized that has been upgraded with a corrosion resistant topcoat finish. All bolts shall be installed and securely torqued so as to prevent change in tightness. Those subject to removal or adjustment shall not be swaged, peened, staked or otherwise installed.

   2. Membrane Tensioning Hardware: The fabric membrane shall be tensioned with load rated hardware which is plated/hot dip galvanized so as to prevent corrosion. Hardware shall allow full and free rotation at the foundation connection to avoid fatigue failure of threaded assemblies.

   3. Membrane Tensioning Webbing: The membrane shall be tensioned with load-tested tie-downs.

   4. Cable Assemblies: Main and wind bracing cable assemblies shall be manufactured to the required length and press swaged with metal sleeves. The cables are manufactured using preformed 7-19 stainless steel cables, sized with appropriate safety factors.
      1. 3/16” dia. = 4,200 lbs.
      2. 1/4" dia. = 7,000 lbs.
      3. 5/16” dia. = 9,800 lbs.
      4. 3/8” dia. = 14,400 lbs.
      5. 1/2" dia. = 22,800 lbs

N. Other Fasteners: Non-structural fasteners such as wood screws, Tek screws, etc., shall be of standard commercial quality

O. Exterior Trim: The aluminum alloy used in the extrusion shall meet or exceed 6063-T6.

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2.5 PRODUCT MANUFACTURER

A. The following manufacturer is preapproved and meets or exceeds this Specification:

   1. Calhoun Super Structures
      3702 Bruce Road #10
      Tara, Ontario N0H 2N0
      Ph: 1-800-264-3994

B. Other building manufacturers will be considered assuming they meet or exceed all specifications. Complete performance specification and references must be submitted for approval

2.6 CAST-IN-PLACE CONCRETE FOUNDATION

A. The Manufacturer's Structural Engineer shall provide base reactions for verification of the proposed foundation design along with a copy of the anchoring requirements, the anchor bolt plan, truss and leg truss line locations. The design structural engineering team will review and provide comments regarding the proposed foundation and retaining wall design.

PART 3 - EXECUTION

3.1 REFERENCES AND STANDARDS

A. The following publications are for the standards listed below but referred to within the document by basic letter designation only. They form a part of this specification to the extent referenced thereto:

a. American Institute of Steel Construction (AISC):

S326-78	Design, Fabrication and Erection of Structural Steel Buildings
S329-85	Structural Joints Using ASTM A325 or A490 Bolts.

b. American Iron and Steel Institute (AISI)

SG 503-76	The Design of Fabrication of Cold-Formed Steel Structures

c. American Society for Testing and Materials (ASTM):

A 36-89	Structural Steel
A 123 A-89	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
A 307-89	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
A 325-89	High-Strength Bolts for Structural Steel Joints
A 500 A-90	Standard Specification for Cold Formed Welded And Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A 563 Rev A-89	Carbon and Alloy Steel Nuts
A 687-89	High-Strength Non-Headed Steel Bolts and Studs.

d. American Society of Civil Engineers (ASCE) Minimum Design Loads for Building and Other Structures. Latest edition as required by State Code.

ASCE 7-02	American Society of Civil Engineers
ASCE 7-05	American Society of Civil Engineers
ASCE 7-08	American Society of Civil Engineers

e. American Welding Society (AWS)

D1.1-2004	Structural Welding Code-Steel
D1.3-98	Structural Welding Code-steel sheet steel

f. National Fire Protection Association

NFPA 701-89.1	Standard methods of Fire Tests for Flame Resistant Textiles and Films. Small and Large Scale Test.
NFPA 701-96	Standard methods of Fire Tests for Flame Resistant Textiles and Films. Test Method 1 and Test Method 2.

END OF SECTION 13 34 13

SECTION 21 24 00 – FUEL ISLAND FIRE SUPPRESSION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section covers design, furnishing and installation of a dry chemical fire suppression system at a gasoline and diesel dispensing island, plus all associated piping, fittings, electrical connections, switches, appurtenances, permitting, and testing required to provide a complete and operable system.

1.2 RELATED WORK

A. Section 33 56 13, Aboveground Fuel Storage Tanks

B. Section 28 09 50, Fuel Dispenser and Management System

C. Division 26, Electrical

1.3 REFERENCES

A. The following standards form a part of this specification and indicate the minimum standards required:

National Fire Protection Association (NFPA)

NFPA 17	Standard for Dry Chemical Extinguishing Systems
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages

Massachusetts Building Code and Fire Prevention Regulations

1.4 SUBMITTALS

A. Shop drawings, details, data sheets, and other descriptive drawings and materials as may be required to fully describe the equipment proposed and to verify conformance with the Contract Documents.

B. Operation & Maintenance Manuals.

C. Detailed fire suppression system engineering drawings stamped by a Massachusetts Professional Engineer and shall obtain approval to install the system from the local Fire Department. Contractor is responsible for paying for and obtaining all permits.

D. Permits and the written results of all tests conducted in the presence of the local Fire Department, allowing operation of the system.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. The system shall be a Pre-Engineered Type and shall be designed to meet UL1254 and NFPA 17 requirements for a Dry Chemical Extinguisher System. The system shall be UL 1254 listed.

B. The system shall be designed to provide required fire suppression for the pump island shown on the Drawings. The system shall provide protection for the complete hazard protection area, as defined by the area within reach of the fuel dispenser hoses and will include both main island and end island protection.

C. The fire suppression system shall be a manufactured by PEM-ALL, Pyrochem, Kidde, or approved equal.

D. Dry chemical cylinders shall be provided with mounting brackets mounted above the dispensers. Actual cylinder size and number shall be determined by the manufacturer to meet UL1254 and code requirements.

E. Operating parts shall include nitrogen bottle switch system, main nozzles and high flow nozzles, 190º F thermostats to automatically activate the fire suppression system, and one manual pull stations as shown on the Drawings. Actual nozzle and thermostat locations and quantities shall be determined by the manufacturer. Nozzles shall not extend higher than 11 feet above the fueling pad elevation and shall not be activated by truck exhaust heat. The thermostats shall be installed generally as shown on the Drawings and in accordance with manufacturer recommendations. The nitrogen bottle and system control panel shall be located within the electrical cabinet located to the south of the fuel island as shown on the drawings, and the conduit carrying the nitrogen shall be in accordance with the manufacturer recommendations and shall be placed in a galvanized rigid steel conduit suitable for direct bury with 12-inches of compacted structural fill all around meeting the subgrade piping requirements on the Equipment Drawings and at sufficient depth to protect it from HS-20 wheel loads. The nitrogen line shall be installed so that it can be replaced in the future if needed without having to dig up the line.

F. System shall be automatically activated using the 190º F thermostats and shall be manually activated using the remote electrical pull stations, as shown on the Drawings. A mechanical override shall be part of the system in event of a power outage. The system activation switch shall be connected to the fuel pump emergency shut-off switches so fuel pumps and all power to the fuel island are deactivated automatically when the fire suppression system is activated either manually or automatically. The manual pull stations shall be marked with a sign indicated “EMERGENCY PUMP SHUTOFF - FIRE SYSTEM RELEASE” consisting of block letters not less than 2-inches in height in red letters on a white background. The fire release system switch shall be weatherproof and placed within a weatherproof enclosure (NEMA 4X) in accordance with the manufacturer’s recommendations. In addition, all components of the fire suppression system shall be weather and corrosion proof as appropriate. The system shall be tied into the building fire alarm system to notify the fire department in the event the system has been activated. The General Contractor shall perform all work necessary to provide a complete and operable system, and will coordinate with work being performed by the Electrical Contractor on the Electrical Drawings. The Electrical Contractor shall provide all other electrical/data/control/fire suppression and alarm conduits/wiring and equipment needed in accordance with manufacturers’ recommendations to provide a complete and operable system.

G. System shall include thermal detection, pneumatic release, pressure switches, fire alarm panel, control panel, and all other components necessary to provide a complete working system.

H. The system piping shall be installed above dispensers on fire suppression support framing as shown on the Drawings. The quantity and location of the fire suppression nozzles shall be determined by the manufacturer.

I. Contractor shall provide electrical service and connections, as required by the manufacturer. Heat sensors, strobe horn, pull station, and control panels shall require single phase, 120 volt power supply.

J. All agent piping shall be threaded Schedule 40 hot-dipped galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall apply for, pay for, and secure all permits required by the work of this section.

B. The system shall be installed in accordance with instructions provided by the manufacturer.

C. System shall be installed by a contractor certified by the manufacturer.

D. The Electrical Contractor shall perform all electrical work needed to provide a complete and operable system. See Electrical Drawings for work to be performed by the Electrical Contractor.

E. The general scope of the fire suppression system is shown on the Drawings and described herein and not all components are specified. The Contractor shall provide all equipment, materials, and equipment necessary for a complete, operable, code compliant, and permitted system, and meeting the manufacturer’s recommendations.

3.2 TESTING

A. The Contractor shall notify the Engineer when the installation has been completed and shall perform all required testing in the presence of and to the satisfaction of the local Fire Department.

B. Following completion of all required testing, the system shall be left fully charged and ready for operation.

C. The Contractor shall train the Owner how to use and operate the system and advise on periodic testing requirements.

END OF SECTION 21 24 00

26 00 01 ELECTRICAL TRADE SUBBID
(Filed Sub Bid Required as Part of Section 26 00 01)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS – TRADE SUB-BID REQUIRED

A. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law Chapter 149, Sections 44A to 44J inclusive; and applicable Section of the MGL, Public Contract Law Chapter 30 as amended.

1.2 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.01A, entitled “Related Documents.

B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. This section applies to all sections of Division 26, 27, & 28, "Electrical” of this project specification unless specified otherwise in the individual sections.

D. The Contractor & Subcontractors shall also refer to the Construction Managers Virtual Design and Construction (VDC) Standards & Specifications. This contract shall provide 3D Coordination Drawings in accordance with Section 26 04 00 and the VDC Standards & Specifications.

1.3 GENERAL REQUIREMENTS

A. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law Chapter 149, Sections 44A to 44J inclusive; and applicable Section of the MGL, Public Contract Law Chapter 30 as amended.

B. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections with DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

C. Each sub-bid filed with the Awarding Authority must be accompanied by BID BOND, or CASH or CERTIFIED CHECK or a TREASURER’S CHECK or CASHIERS’S CHECK issued by a responsible bank or trust company, payable to the Owner in the amount of five percent (5%) of the bid amount. A sub-bid accompanied by any other form of bid deposit will be rejected.

D. Each sub-bid, submitted for the work of this Section, shall be on a form furnished by the Awarding Authority, as required by Section 44F of Chapter 149, as amended.

E. Sub-Sub-Bid Requirements:
  1. CLASS OF WORK: REFERENCE ARTICLE:
    a. Section 26 41 13 – Facility Lightning Protection.
    b. Section 28 31 00 – Fire Detection and Alarm.

F. The following specifications sections shall be part of this file sub-bid section:

26 00 01	Electrical Trade Subbid
26 04 00	General Conditions for Electrical Trades
26 05 19	Electrical Power Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceway and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems
26 09 23	Lighting Control Devices
26 24 16	Panelboards
26 27 16	Cabinets and Enclosures
26 27 26	Wiring Devices
26 41 13	Lightning Protection for Structures
26 51 00	Lighting
270529	Hangers and Supports for Communications Systems
270533	Raceway and Boxes for Communications Systems
270553	Identification for Communications Systems
271000	Structured Cabling
28 05 29	Hangers and Supports for Electronic Safety and Security
28 05 33	Raceway and Boxes for Electronic Safety and Security
28 05 53	Identification for Electronic Safety and Security
28 31 00	Fire Detection and Alarm

1.4 FILING OF SUB-BIDS

A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.

B. Examine all other Sections of the specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Work of this section is shown on the following Drawings
ELECTRICAL DRAWINGS

SU1.00	SITE UTILITY PLAN
E0.01	ELECTRICAL ABBREVIATIONS, NOTES, SYMBOLS AND DETAILS
ELP1.00	ELECTRICAL LIGHTING AND POWER FLOOR PLAN
E2.02	ELECTRICAL RISER – FUEL ISLAND
E6.10	ELECTRICAL SCHEDULES AND DIAGRAMS

1.5 SCOPE OF WORK

A. The scope of work consists of the installation of all materials to be furnished under Division 26 and without limiting the generality thereof, consists of furnishing all labor, materials, equipment, plant, transportation, rigging, staging up to roof, appurtenances, and services necessary and/or incidental to properly complete all work as shown on the Electrical drawings, as described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect.

1.6 RELATED WORK SPECIFIED ELSEWHERE

A. The following related work or materials shall be provided under the designated Sections and coordinated by the Contractor:

2. Cutting and Patching including openings in concrete masonry floors, walls and roof shall be coordinated with the Filed Subcontractor cutting and patching responsibilities described in Section 01 73 19, 3.03B.1 and C.1.
3. Lifting and Hoisting: Where lifting and Hoisting is required, the Filed Subcontractor shall provide the entire installation for the scope of work. Refer to Section 01 50 00 “Temporary Facilities and Controls”.

1.7 SUBMITTALS

A. Attention is directed to Specification Section 01 3000 Submittals and Section 26 0400 General Conditions for Electrical Trades

1.8 RECORD DRAWINGS

A. Refer to Specification Section 01 7839 Project Record Documents and Section 26 0100 General Conditions for Electrical Trades for the Record Drawing requirements for this section.

B. The marked up As Built Drawings required to be maintained under this section are of the following Drawings:

C. ALL DRAWINGS LISTED IN PARAGRAPH 1.3(D) OF THIS SECTION.

D. Availability of marked up As Built drawings shall be a prerequisite to scheduling final inspection of this contract and said drawings and original contract documents will be used in checking completion of the work.

E. Non-availability of marked up As Built drawings or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the Architect until the discrepancy has been corrected.

1.9 OPERATING AND MAINTENANCE MANUALS

A. Refer to Section 26 0400 General Conditions for Electrical Trades for the Operating and Maintenance Manual requirements for this Contract.

B. The Electrical subcontractor shall provide the Contractor five (5) sets of operating and maintenance instructions of all mechanical and electrical equipment furnished and installed under this section.

C. The Contractor shall collect the operating instructions, bind them into two complete sets and deliver them to the Architect who will check for completeness and deliver them to the Owner.

D. Delivery of the operating and maintenance manuals shall be a condition precedent to final payment.

1.10 INSTRUCTION OF OWNER’S PERSONNEL

A. Refer to Section 26 0400 General Conditions for Electrical Trades for the Instruction of Owner’s Personnel requirements for this Contract.

B. The Electrical subcontractor shall instruct the Owner’s personnel, at the site, in the use and maintenance of equipment installed under this section.

C. Submission to the Architect of a certificate of compliance to this requirement, signed by the Contractor and the Owner’s Representative shall be a condition precedent to final payment.

1.11 GUARANTEE AND SERVICE

A. Notwithstanding any other requirements of this contract, the Electrical Subcontractor shall guarantee the performance of the installation and equipment included in this Section for one year from the date of Substantial Completion as defined in the General Conditions. Should any defects in materials or workmanship appear during this period, they shall be corrected or replaced by the Electrical Subcontractor to the satisfaction of the Architect, and at no expense to the Owner.

1.12 PERMITS

A. The subcontractors attention is directed to the General Conditions. This subcontractor shall be responsible for obtaining and paying for all permits and inspections required to complete all Work described in this section.

PART 2 MATERIALS

2.1 Refer to specification sections referenced in 1.2 above for specific material requirements for work of this section.

PART 3 EXECUTION

3.1 Refer to specification sections referenced in 1.2 above for specific execution requirements for work of this section.

END OF SECTION – 26 00 01

26 04 00 GENERAL CONDITIONS FOR ELECTRICAL TRADES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. This section applies to certain sections of Division 08 “Openings”, Division 11 “Equipment”, Division 12 “Furnishings”, Division 21“Fire Protection, Division 22 “Plumbing”, Division 23 "Mechanical," Division 27 “Communications”, Division 28 “Electronic safety and Security”, Division 33 “Utilities” and this section applies to all sections of Division 26, "Electrical" of this project specification unless specified otherwise in the individual sections.

C. The Drawings of other trades Architectural, Structural, Landscape, Civil, Mechanical, Fire Protection and Plumbing, Food Service, Communications, and Electronic Safety and Security shall be examined for coordination and familiarity of work with other Contractors. Any duplication or omission of provisions in this project should be brought to the attention of the Owners prior to Bidding.

D. The drawings of equipment suppliers shall be examined for coordination and familiarity of work with Owner’s equipment suppliers.

1.2 DESCRIPTION

A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.

B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division, (Division 27 and Division 28). Where conflicts exist between the drawings and the specifications or between this section of the specifications and other sections, the more stringent or higher cost option shall apply.

C. It is the intent of this Section of the Specifications to establish a standard of quality and performance characteristics for basic materials and installation methods used in building electrical (communications and electronic safety and security) systems.

1.3 INTENT

A. This contract is for all labor, materials and equipment required for installation. The system shall be complete and finished in all respects, tested and ready for operation. Work shall include calibration of equipment with factory settings. All materials, equipment and apparatus shall be new and of first class quality.

B. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.

C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.

D. Work under each Section shall include giving written notice to the Owner and Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

E. Location of all existing systems and equipment shown on floor plans is based on the best available information. The Contractor shall verify all dimensions and locations of existing systems and equipment in the field and adjust as necessary.

F. Certain items of existing equipment may be indicated for removal or relocation. Items noted for removal shall be disconnected and turned over to the Owner or disposed of by the Contractor if the Owner so requests. If instructed to dispose of items, the Contractor shall remove the items from the premises and dispose of them in a safe, legal and responsible manner and location. Items noted for relocation are intended for reuse in another location as designated on the Drawings. It shall be the responsibility of the Contractor to remove the material from its present location, store the material in a safe place and reinstall the material in its new location. Questions regarding the suitability of the material or equipment shall be brought to the attention of the Owner and Engineer in writing.

G. Wherever a particular piece of equipment, device or material is specifically indicated on the Drawings by model number, type, series or other means, that specification shall take precedence over equipment or materials specified herein. For example: If a particular switch is specified on the Drawings, its specification takes precedence over switch specified herein.

1.4 DEFINITIONS

A. Word “Subcontractor” means specifically the subcontractor working under this Division. Other Contractors are specifically designated “Plumbing Subcontractor”, “General Contractor” and so on. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.

B. Word “install” shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.

C. Words “furnish” or “supply” shall mean purchase, deliver to, and off-load at the job site, all ready to be installed including where appropriate all necessary interim storage and protection.
D. Word “provide” shall mean furnish (or supply) and install as necessary.
E. Word “finished” refers to all rooms and areas scheduled to be painted in Room Finish Schedule on the drawings. All rooms and areas not covered in Schedule, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
F. No Exceptions Taken – reviewed and determined to be in general conformance with contract documents.
G. Words “approved equal” mean any product which in the opinion of the Engineer is equal in quality, arrangement, appearance, and performance to the product specified.
H. Word “wiring” shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
I. Word “product” shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
J. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions."
K. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
L. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
M. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
N. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
O. Remove: The term “remove” means “to disconnect from its present position, remove from the premises and to dispose of in a legal manner.”

P. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

Q. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.5 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect. (Do not scale the drawings)

B. Work under each Section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; where space conditions appear inadequate, Owner and Engineer shall be notified before proceeding with installations.

C. The Owner may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.

D. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, higher rating, or higher value shall be included in the Contract price. The Owner and Engineer shall decide on the item and the manner in which the work shall be installed.

1.6 SURVEYS AND MEASUREMENTS

A. Before submitting his Bid, the Contractors shall visit the site and become thoroughly familiar with all existing conditions under which his work will be installed. This Contract includes all modifications of existing systems required for the installation of new equipment. This Contract includes all necessary offsets, transitions and modifications required to install all new equipment in existing spaces. All new and existing equipment and systems shall be fully operational under this Contract before the job is considered complete. The Contractors shall be held responsible for any assumptions he makes, any omissions or errors he makes as a result of his failure to become fully familiar with the existing conditions at the site and the Contract Documents.

B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or which interfere with the intent of the Drawings and Specifications, the Engineer will be notified and work will not proceed until instructions from the Engineer are received.

1.7 CODES AND STANDARDS

A. Reference Standard Compliance

1. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
2. Independent Testing Organization Certificate: In lieu of the label or listing, indicated above submit a certificate from an independent testing organization, competent to perform testing, and approved by the engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

B. The Following Codes and Standards for the state and local jurisdiction where the project is located as listed below apply to all electrical work. Wherever Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision shall be followed:

Massachusetts State Building Code Including all Supplements
Massachusetts State Fire Safety Code Including all Supplements
The International Building Code
The International Mechanical Code
The International Plumbing Code
NFPA 70, the National Electrical Code
Model Energy Code
NECA - 1 Standard for Good Workmanship in Electrical Construction
ASHRAE 90.1 and International Energy Conservation Code

C. The following Standards shall be used where referenced by the following abbreviations:

AIA	American Institute of Architects
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
EPA	Environmental Protection Agency
FM	Factory Mutual
FSSC	Federal Specification
IEEE	Institute of Electrical and Electronics Engineers
NBS	National Bureau of Standards

NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSC	National Safety Council
OSHA	Occupational Safety and Health Administration
UL	Underwriters' Laboratories

D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.

E. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.

1.8 PERMITS AND FEES

A. The Contractor shall give all necessary notices, obtain all permits; and pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the work, file all necessary Drawings, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspection for his work, and deliver a copy to the Owner and Engineer before request for acceptance and final payment for the work.

1.9 EQUIPMENT EQUIVALENTS AND SUBSTITUTIONS

A. Certain manufacturers of material, apparatus or appliances are indicated in the drawings and specifications for this project. These items have been used as the basis of design, and as a convenience in fixing the minimum standard of workmanship, finish and design that is required. If the Contractors uses an "approved equal" alternative to the basis of design, and if the features of that alternative have an impact on other components of the Project, the Contractor shall include the necessary adjustments in those components, whether for architectural, structural, mechanical, electrical, fire protection, or any other elements, plus any adjustments for difference in performance.

B. Where one name only is used and is followed by the words "or approved equal", the Contractor must use the item named or he is required to apply for a substitution. Where one name only is used, the Contractor must use that item named.

C. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for Architect and Engineer review.

D. Where the Contractor proposes to use an item that is different from the basis of design in the Drawings and specifications, and that will require the redesign of the structure, partitions, foundations, piping, wiring or any other component of the mechanical, electrical, or architectural layout, the Contractor shall provide the necessary redesign of those components.

E. Where the Contractor proposes to deviate (provide an equivalent or request for substitution) from the basis of design scheduled equipment or materials as hereinafter specified or shown on the drawings, they are required to submit a requested for substitution in writing. The Contractor shall state in their request whether it is a substitution, equivalent or a non approved equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.

F. If an alternative or substitute item results in a difference in quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall furnish and install any such additional equipment required by the system, at no additional cost to the Owner including any costs added to other trades due to the equivalent change from the basis of design detailed in the drawings or included within the specifications.

G. Equipment, material or devices submitted for review as an "equivalent" shall meet the following requirements:
    1. The equivalent shall have the same construction features such as, but not limited to:
        a. Material thickness, gauge, weight, density, etc.
        b. Welded, riveted, bolted, etc., construction
        c. Finish, undercoating, corrosion protection
    2. The equivalent shall perform with the same or better operating efficiency.
    3. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.
    4. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as UL or NEMA labels.

H. Equipment, material or devices submitted for review as a "substitution" shall meet the following requirements:
    1. Substitution Request Submittal: Requests for substitution will be considered if received in writing 14 days before the bid date. Requests received later than 14 days before the bid date may be considered or rejected at the discretion of the Engineer/Owner. Once the Contractor submits a complete request for substitution as determined by the engineer, the engineer reserves the right to request the time necessary to evaluate the request for substitution and review it with the Owner.
    2. Submit three (3) copies of each request for substitution for consideration.
    3. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
        a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
        b. Samples, where applicable or requested.

c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
f. Cost information, including a proposal of the net change, if any in the Contract Sum.
g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
h. Engineer's Action: Within one week of receipt of the request for substitution, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance of a product substitution will be in the form of an Addendum.
i. Other Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.
    1) The request is directly related to an "or equal" clause or similar language in the Contract Documents.
    2) The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
    3) A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

1.10 SUBMITTAL PROCEDURES

A. Provide Submittals in accordance with the requirements of Division 1 and as indicated in the following.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
   1. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
   2. If an intermediate submittal is necessary, process the same as the initial submittal.
   3. Allow two weeks for reprocessing each submittal.
   4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
   1. Include the following information on the label for processing and recording action taken.
      a. Project name.
      b. Date.
      c. Name and address of Engineer.
      d. Name and address of Contractor.
      e. Name and address of subcontractor.
      f. Name and address of supplier.
      g. Name of manufacturer.
      h. Number and title of appropriate Specification Section.
      i. Drawing number and detail references, as appropriate.

E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

F. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.

G. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

1.11 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Electrical Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.

C. Provide shop drawings for all devices specified under equipment specifications for all systems including fire alarm, switchgear, clock, lighting, etc., or where called for elsewhere in the Specifications, or where scheduled on the drawings, or where called out on the drawings. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, dimensions, identification of products and materials included, compliance with specified standards, notation of coordination requirements, notation of dimensions established by field measurement and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, performance cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.

D. Submittals shall be marked with the trade involved, i.e., Electrical, HVAC, Plumbing, Fire Protection, etc. when the submittal could involve more than one trade.

E. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.

F. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer.

G. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.

H. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

I. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

J. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.

K. Acceptance of shop drawings does not relieve the Contractor from submitting, coordinating and implementing schedules, forms, worksheets and similar as required for owner/operator input and approval as specified herein and required for proper system operation.

L. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.

M. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the Engineer in writing at least five (5) working days prior to Bidding to allow for issuance of an Addendum.

N. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.12 COORDINATION DRAWINGS

A. Prepare coordination drawings in accordance with Division 01 Section "PROJECT COORDINATION," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of light fixtures, panelboards, conduits, cabinets, etc. Include the following:
2. Clearances for installing and maintaining insulation.
3. Clearances for servicing and maintaining equipment, including NEC requirements and space for equipment disassembly required for periodic maintenance.
4. Equipment connections and support details.
5. Exterior wall and foundation penetrations.
6. Fire-rated wall and floor penetrations.
7. Sizes and locations of required concrete pads and bases.

B. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

C. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

D. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

E. Electronic copies of the MEP floor plans are available to use as a basis for preparing coordination drawings and can be provided by the Engineer. If the Contractor elects to obtain the Engineers electronic files an Electronic File Release Form must be submitted. This form must be signed by the Contractor, Owner, and Architect. Upon receipt of a signed copy of the Electronic File Release Form, the Engineer will provide copies of the electronic files for the Contractor’s use. A copy of the Electronic File Release Form is appended to the end of this specification section

1.13 COORDINATION WITH OTHER DIVISIONS

A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.

B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork, heating, condenser, chilled water piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.

C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.

D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.

E. Where work is installed prior to preparation and approval of the Coordination Drawings or in conflict with the approved Coordination drawings and if so directed in other Sections, the Contractor indicated shall prepare composite working drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner.

1.14 WORKMANSHIP

A. Service Support: The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. Modification of References: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.

C. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, journeymen, electricians, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.

D. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

E. All labor for installation of electrical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.15 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner.

B. The Engineer and the Owner shall be notified in writing of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.16 TEMPORARY UTILITIES

A. General: Provide new materials and equipment; if acceptable to the Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

C. First Aid Supplies: Comply with governing regulations.

D. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

E. Provide temporary lighting in all areas, throughout construction activities.
   1. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Engineer, and will not be accepted as a basis of claims for a Change Order.
   2. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
      a. Except where overhead service must be used, install electric power service underground.
      b. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
   3. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period.

F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

G. Termination and Removal: Unless the Engineer requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

1.17 PROJECT PHASING

A. Work under each Section shall include all necessary temporary connections, equipment, conduit, wiring, fire alarm equipment and testing, lighting and emergency lighting, fire stopping, connection of necessary mechanical equipment, labor, and material as necessary to accommodate the phasing of Construction as developed by the General Contractor or Construction Manager and approved by the Owner. All existing systems that pass-thru an area of the building or are required to be maintained in a phased fashion during construction shall remain operational during all phases of construction. No extra compensation shall be granted the Contractor for work required to maintain existing systems operational or to accommodate the construction phasing of the project.

1.18 PROTECTION OF MATERIALS AND EQUIPMENT

A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.

B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.19 ADJUSTING AND TESTING

A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.

B. Where requested by the Engineer or specified in the contract documents, a factory-trained service representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service representative shall notify the Contractor in writing that the equipment was installed according to manufacturer’s recommendations and is operating as intended by the manufacturer. Factory start-up reports shall be included in the operation and maintenance manuals under the appropriate equipment section.

1.20 CLEANING

A. The Contractor shall thoroughly clean all equipment of all foreign substances, oils, dust, dirt, etc., inside and out before final acceptance by the Engineer.

B. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

C. During the course of construction, all conduits shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.

D. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work.

E. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces and panelboard interiors.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.

F. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove and dispose of ALL waste materials, packaging material, skids etc. from the site and dispose of in a lawful manner in accordance with municipal, state and federal regulations.

G. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

1.21 OPERATING AND MAINTENANCE

A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner’s representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least seven (7) day notice to the Owner and the Engineer in advance of this period.

B. The Contractor shall include the maintenance schedule for the principal items of equipment furnished under this Division.

C. The Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.

D. An authorized manufacturer’s representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. At a minimum, the following equipment will require this inspection: emergency generator, fire alarm system, nurse call system, paging systems, etc. These letters will be bound into the operating and maintenance books.

E. Refer to individual trade Sections for any other particular requirements related to operating instructions.

F. Demonstration shall be recorded on CD Rom with two (2) discs turned over to the Owner.

1.22 OPERATING AND MAINTENANCE MANUALS

A. Prepare operating and maintenance manuals in accordance with the requirements of Division 1 and as follows. The Contractor shall prepare six (6) copies of a complete maintenance and operating instructions manual, bound in booklet form. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder.

B. Manual shall include the following:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. Emergency instructions.
6. Spare parts list.
7. Copies of warranties.
8. Wiring diagrams.
9. Recommended "turn around" cycles.
10. Inspection procedures.
11. Shop Drawings and Product Data.
12. Equipment start-up reports.

C. Include in the manual, a tabulated equipment schedule for all equipment. Schedule shall include pertinent data such as: make, model number, serial number, voltage, normal operating current, belt size, filter quantities and sizes, bearing number, etc. Schedule shall include maintenance to be done and frequency.

D. Maintenance and instruction manuals shall be submitted to the Owner at the same time as the seven (7) day notice is given prior to the instruction period.

1.23 ACCEPTANCES

A. The equipment, materials, workmanship, design and arrangement of all work installed under the Electrical Sections shall be subject to the review of the Engineer.

B. Within 30 days after the awarding of a Contract, the Electrical Contractor shall submit to the Engineer, for review, a list of manufacturers of equipment proposed for the work under the Electrical Sections. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the Owner and Engineer, in writing, within 30 days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner’s representative.

D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Electrical Contractor shall verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

E. If material or equipment is installed before it is reviewed and/or approved, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.

F. Failure on the part of the Engineer to reject shop drawings or to reject work in progress shall not be interpreted as acceptance of work not in conformance with the Drawings and/or Specifications. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.24 RECORD DRAWINGS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

5. Final record documents shall be prepared in the latest Revit version and digital media for all drawings and a clean set of reproducible paper copies shall be turned over to the Owner at the completion of the work.

1.25 WARRANTIES AND BONDS

A. The following general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties are to be included:
   1. General close-out requirements included in Section "Project Close-out."
   2. Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions 02 through 50.
   3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

1.26 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.

H. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.

I. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.

   1. Refer to individual Sections of Divisions 2 through [16][50] for specific content requirements, and particular requirements for submittal of special warranties.

J. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

K. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

   1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
   2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
   3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.27 GUARANTEES

A. The Contractor shall guarantee all material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineers satisfaction.

B. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided

1.28 PROJECT CLOSE-OUT

A. Contractor shall submit annual maintenance proposal to the Architect/Engineer for review and approval as part of the close out documents.
B. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
C. Deliver tools, spare parts, extra stock, and similar items.
D. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
E. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
F. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
  1. The Engineer will repeat inspection when requested and assured that the Work has been substantially completed.
  2. Results of the completed inspection will form the basis of requirements for final acceptance.

END OF SECTION – 26 04 00

Electronic File Release Form

DELIVERY OF ELECTRONIC FILES FOR: ____
Project Name

In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Design Professional, the Client covenants and agrees that all such drawings and data are instruments of service of the Design Professional, who shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

The Client further agrees not to use these drawings and data, in whole or in part, for any purpose or project other than the project which is the subject of this Agreement. The Client agrees to waive all claims against the Design Professional resulting in any way from any unauthorized changes or reuse of the drawings and data for any other project by anyone other than the Design Professional.

In addition, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Design Professional harmless from any damage, liability or cost, including reasonable attorneys' fees and costs of defense, arising from any changes made by anyone other than the Design Professional or from any reuse of the drawings and data without the prior written consent of the Design Professional.

Under no circumstances shall transfer of the drawings and other instruments of service on electronic media for use by the Client be deemed a sale by the Design Professional, and the Design Professional makes no warranties, either express or implied, of merchantability and fitness for any particular purpose.

________________________________ Client's Signature	____________________ Date
________________________________ Company - Title	
________________________________ Architects' Signature	____________________ Date
________________________________ Firm - Title	
________________________________ Owner's Signature	____________________ Date
________________________________ Company - Title	

26 05 19 ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.
B. Underground feeder and branch-circuit cable.
C. Armored cable.
D. Power and control tray cable.
E. Mineral Insulated Cable (Type M.I.)
F. Wiring connectors.
G. Electrical tape.
H. Heat shrink tubing.
I. Oxide inhibiting compound.
J. Wire pulling lubricant.
K. Cable ties.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements.
B. Division 07 – Thermal and Moisture Protection.
C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 28 3100 - Fire Detection and Alarm: Fire alarm system conductors and cables.
F. Section 31 2316 - Excavation.
G. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
H. Section 31 2323 - Fill: Bedding and backfilling.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
E. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
F. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification; Revision A, 2008.
G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
I. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
O. UL 183 - Manufactured Wiring Systems; Current Edition, Including All Revisions.
P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
U. UL 719 – Nonmetallic-Sheathed Cables; Current Edition, Including All Revisions.
V. UL 854 – Service-Entrance Cables; Current edition, Including All Revisions.
W. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.
X. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.
D. Field Quality Control Test Reports.
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Division 01 – General Requirements.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
C. Nonmetallic-sheathed cable is not permitted, unless noted otherwise.
D. Service entrance cable is not permitted, unless noted otherwise.
E. Armored cable is not permitted.
F. Metal-clad cable is not permitted.
G. Manufactured wiring systems are not permitted.
H. Mineral Insulated Cable permitted as follows:
    1. Rated Feeders requiring a 2-hour protective rating.
    2. Fire Alarm and Control Circuits requiring survivability rating.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Provide conductors and cables with lead content less than 300 parts per million.
D. Provide new conductors and cables manufactured not more than one year prior to installation.
E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
F. Comply with NEMA WC 70.
G. Comply with FS A-A-59544 where applicable.
H. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
I. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
J. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
K. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
L. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
M. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
N. Conductor Material:
    1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, or ASTM B8unless otherwise indicated.
    2. Tinned Copper Conductors: Comply with ASTM B33.
    3. Aluminum Conductors: Not Permitted.

O. Minimum Conductor Size:
    1. Branch Circuits: 12 AWG.
        a. Exceptions:
            1) 20 A, 120 V circuits longer than 100 feet 10 AWG minimum, and sized for voltage drop.
            2) 20 A, 120 V circuits longer than 165 feet 8 AWG minimum, and sized for voltage drop.

        3) 20 A, 277 V circuits longer than 250 feet: 10 AWG minimum, and sized for voltage drop.
    2. Control Circuits: 14 AWG.

P. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Q. Conductor Color Coding:
    1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
    2. Color Coding Method: Integrally colored insulation.
        a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
    3. Color Code:
        a. 208Y/120 V, 3 Phase, 4 Wire System:
            1) Phase A: Black.
            2) Phase B: Red.
            3) Phase C: Blue.
            4) Neutral/Grounded: White.
        b. Equipment Ground, All Systems: Green.
        c. Isolated Ground, All Systems: Green with yellow stripe.
        d. Travelers for 3-Way and 4-Way Switching: Pink.
        e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
        f. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
    1. Copper Building Wire:
        a. Cerro Wire LLC.
        b. Southwire Company
        c. General Cable Technologies
        d. Substitutions: See Section 01 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
    1. Feeders and Branch Circuits:
        a. Size 10 AWG and Smaller: Solid.
        b. Size 8 AWG and Larger: Stranded.
    2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
    1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

a. Installed Underground: Type XHHW-2.

2.4 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Manufacturers:
   1. Cerro Wire LLC.
   2. Encore Wire Corporation.
   3. Southwire Company.
   4. General Cable Technologies.
   5. Substitutions: See Section 01 - Product Requirements.

B. Description: Single conductor insulated wire.
C. Provide equipment grounding conductor unless otherwise indicated.
D. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

E. Insulation Voltage Rating: 600 V.
F. Insulation: Type XHHW-2.

2.5 POWER AND CONTROL TRAY CABLE

A. Manufacturers:
   1. Encore Wire Corporation: www.encorewire.com.
   2. Okonite: www.okonite.com.
   3. Southwire Company: www.southwire.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.
C. Where exposed run cable is indicated between cable tray and utilization equipment in qualifying industrial establishments as determined by authorities having jurisdiction, provide tray cable marked as Type TC-ER in accordance with NFPA 70.
D. Conductor Stranding: Stranded.
E. Insulation Voltage Rating: 600 V.
F. Insulation: Type XHHW or XHHW-2.
G. Grounding: Full-size integral equipment grounding conductor.
H. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.6 MINERAL INSULATED CABLE (TYPE M.I.)

A. Rating: M.I. cables shall be U.L. Listed and rated for 2 hours fire resistivity.

B. Handling: Cables shall be installed, stored, prepared, and terminated per manufacturer's requirements.
C. Splices: Splices shall be performed by manufacturer's representative or certified personnel trained in proper termination techniques.
D. Supports: Provide cable supports at 3'-0" max. horizontally, 6'-0" max. vertically. Anchors shall be steel.
E. Configuration: Single conductors run together to form multi-phase feeders shall be installed in a tri-foil configuration. All sheaths shall maintain contact with each other until entering into termination enclosure. Provide stainless steel straps to form bundles. Straps shall be installed at 3'-0" max. horizontal and vertical runs.
F. Sheath material: Seamless soft-drawn copper.
G. Lugs: Cables shall terminate on approved lugs.
H. Manufacturers: Pyrotenax/Pentair.

2.7 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
C. Wiring Connectors for Splices and Taps:
    1. Copper conductors 10 AWG and smaller: Install insulated spring wire connectors with plastic caps
    2. Copper Conductors Size 8 AWG: Install solderless pressure connectors with insulating covers
    3. Copper Conductors Size 6 AWG and larger: Install pressure connectors or split bolt connectors.

D. Wiring Connectors for Terminations:
    1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
    2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
    3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
    4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
    5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
    6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.

7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
    1. Manufacturers:
        a. 3M
        b. Ideal Industries, Inc.
        c. NSI Industries LLC.
        d. Ilsco
        e. Erico
        f. Substitutions: See Division 01 – General Requirements.

H. Mechanical Connectors: Provide bolted type or set-screw type.
    1. Manufacturers:
        a. Burndy LLC.
        b. Ilsco
        c. Thomas & Betts Corporation
        d. Substitutions: See Division 01 – General Requirements.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
    1. Manufacturers:
        a. Burndy LLC.
        b. Ilsco
        c. Thomas & Betts Corporation
        d. Erico
        e. Substitutions: See Division 01 – General Requirements.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
    1. Manufacturers:
        a. Burndy LLC.
        b. Ilsco
        c. Thomas & Betts Corporation
        d. Substitutions: See Division 01 – General Requirements.

2.8 WIRING ACCESSORIES

A. Electrical Tape:
    1. Manufacturers:
        a. 3M
        b. Plymouth Rubber Europa
        c. Substitutions: See Division 01 – General Requirements.

2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F .
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
   1. Manufacturers:
      a. 3M
      b. Burndy LLC.
      c. Thomas & Betts Corporation
      d. Substitutions: See Division 01 – General Requirements.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy LLC.
      b. Ideal Industries, Inc.
      c. Ilsco
      d. Substitutions: See Division 01 – General Requirements.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
   1. Manufacturers:
      a. 3M
      b. American Polywater Corporation
      c. Ideal Industries, Inc.
      d. Substitutions: See Division 01 – General Requirements.

E. Cable Ties: Material and tensile strength rating suitable for application.
   1. Manufacturers:
      a. Burndy LLC.
      b. Substitutions: See Section 01 - Product Requirements.
   2. Provide plenum rated cable ties.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.
C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
D. Verify that field measurements are as shown on the drawings.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:
    1. Unless dimensioned, circuit routing indicated is diagrammatic.
    2. When circuit destination is indicated and routing is not shown, determine exact routing required.
    3. Arrange circuiting to minimize splices.
    4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
    5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
    6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted. Where combining branch circuit in a single raceway is indicated:
        a. Dedicated neutral conductors are considered current-carrying conductors.
        b. Increase size of conductors as required accounting for ampacity derating.
        c. Size raceways, boxes, etc. to accommodate conductors.
    7. Common Neutrals: Not allowed.

B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Installation in Raceway:
    1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
    2. Pull all conductors and cables together into raceway at same time.
    3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
    4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
    1. Installation above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
    2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

G. Terminate cables using suitable fittings.
    1. Metal-Clad Cable (Type MC):
        a. Use listed fittings.
        b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
        c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
        d. Secure at maximum interval of 5 ft.
        e. Install parallel and perpendicular to building lines.
        f. Bundle cables in common routes back to panelboards.
        g. Secure from structure using suitable J-hooks or plenum rated cable ties.

H. Install conductors with a minimum of 12 inches of slack at each outlet.
I. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
L. Make wiring connections using specified wiring connectors.
    1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
    2. Do not remove conductor strands to facilitate insertion into connector.
    3. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
    4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
    5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.
O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
P. Identify conductors and cables in accordance with Section 26 0553.
Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07.
R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
S. Mineral Insulated Cable Installation:
    1. The wiring and cable shall be installed according to the manufacturers' recommendations, the instructions in the installation and specifications manual and the requirements of the UL Fire Resistance Directory listing.
    2. Provide brass glands, termination kits and fittings from the same manufacturer as the cable. Provide brass plates for entrance fittings to ferrous enclosures per the manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

A. See Division 01 – General Requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION – 26 05 19

26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.
E. Ground rod electrodes.
F. Chemically-enhanced ground electrodes.
G. Ground plate electrodes.
H. Ground enhancement material.
I. Ground access wells.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements
B. Division 03– Concrete.
C. Division 09 - Finishes.
D. Section 26 0400 – General Conditions for Electrical Trades
E. Section 26 0519 - Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
    1. Includes oxide inhibiting compound.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
G. Section 26 4113 –Lightning Protection for Structures.
H. Section 26 5100 - Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.
I. Section 33 7900 - Site Grounding.

1.3 REFERENCE STANDARDS (follow the most currently adopted amended version)

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings.
D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
E. NFPA 70 - National Electrical Code.
F. NFPA 99 - Health Care Facilities Code.
G. NFPA 780 - Standard for the Installation of Lightning Protection Systems.
H. UL 467 - Grounding and Bonding Equipment.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. For signal reference grids, coordinate the work with access flooring furnished in accordance with Division 09- Finishes.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
C. Shop Drawings:
   1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Field quality control test reports.
F. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
E. Grounding System Resistance:
    1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:
1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    a. Provide continuous grounding electrode conductors without splice or joint.
    b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
    a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Other Metal Piping:
    a. Provide connection to all metallic gas piping and miscellaneous metal piping of continuous lengths.
    b. Bond in accordance with NFPA 70.
    c. Size bonding conductor in accordance with NFPA 70.
4. Metal In-Ground Support Structure:
    a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
5. Concrete-Encased Electrode:
    a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
6. Ground Ring (Counterpoise):
    a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
    b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
    c. Provide ground enhancement material around conductor where indicated.
    d. Provide connection from ground ring conductor to:
        1) Perimeter columns of metal building frame.
        2) Ground rod electrodes located as indicated.
        3) Building service equipment grounding bus..
7. Ground Rod Electrode(s):
    a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

        b. Space electrodes not less than 22 feet from each other and any other ground electrode.
        c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
        d. Provide ground enhancement material around electrode where indicated.
        e. Provide ground access well for each electrode.
    8. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
    9. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
        a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
        b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
        c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
    10. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

G. Service-Supplied System Grounding:
    1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
    2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
    1. Provide grounding electrode system for each separate building or structure.
    2. Provide equipment grounding conductor routed with supply conductors.
    3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
    4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Bonding and Equipment Grounding:
    1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
    2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    b. Metal gas piping.
    c. Metal process piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.
10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

J. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

K. Facility Lightning Protection Systems, in Addition to Requirements of Section 26 4100:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0519:
  1. Use insulated copper conductors unless otherwise indicated.
    a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).
  2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.

C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
    a. Exceptions:
      1) Use mechanical connectors for connections to electrodes at ground access wells.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
    a. Exceptions:
      1) Use exothermic welded connections for connections to metal building frame.
  4. Manufacturers - Mechanical and Compression Connectors:
    a. Advanced Lightning Technology (ALT)
    b. Burndy LLC.
    c. Harger Lightning & Grounding
    d. Thomas & Betts Corporation
    e. Substitutions: See Division 01 - General Requirements.
  5. Manufacturers - Exothermic Welded Connections:
    a. Burndy LLC.
    b. Cadweld, a brand of Erico International Corporation
    c. ThermOweld, a brand of Continental Industries, Inc.Substitutions: See Division 01 - General Requirements.

D. Ground Bars:
  1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.
  4. Manufacturers:
    a. Advanced Lightning Technology (ALT)
    b. Erico International Corporation
    c. Harger Lightning & Grounding
    d. ThermOweld, a brand of Continental Industries, Inc.
    e. Substitutions: See Division 01 - General Requirements.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
5. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation
    - c. Galvan Industries, Inc.
    - d. Harger Lightning & Grounding
    - e. Substitutions: See Division 01 - General Requirements.

F. Chemically-Enhanced Ground Electrodes:

1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.
2. Length: 10 feet.
3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.
4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.
5. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation
    - c. Harger Lightning & Grounding
    - d. ThermOweld, subsidiary of Continental Industries
    - e. Substitutions: See Division 01 - General Requirements.

G. Ground Plate Electrodes:

1. Material: Copper.
2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
3. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation
    - c. Harger Lightning & Grounding
    - d. ThermOweld, subsidiary of Continental Industries
    - e. Substitutions: See Division 01 - General Requirements.

H. Ground Enhancement Material:

1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
2. Resistivity: Not more than 20 ohm-cm in final installed form.
3. Manufacturers:
    - a. Erico International Corporation
    - b. Harger Lightning & Grounding
    - c. ThermOweld, subsidiary of Continental Industries
    - d. Substitutions: See Division 01 - General Requirements.

I. Ground Access Wells:
   1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
      a. Areas Exposed to Light Vehicular Traffic: Rated for not less than 22,500 pounds vertical design load.
   2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
      a. Round Wells: Not less than 8 inches in diameter.
      b. Rectangular Wells: Not less than 12 by 12 inches.
   3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
   4. Cover: Factory-identified by permanent means with word "GROUND".
   5. Manufacturers:
      a. Advanced Lightning Technology (ALT)
      b. Erico International Corporation
      c. Harger Lightning & Grounding
      d. ThermOweld, subsidiary of Continental Industries
      e. Substitutions: See Division 01 - General Requirements.

J. Oxide Inhibiting Compound: Comply with Section 26 0519.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that field measurements are as shown on the drawings.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Remove paint, rust, mill oils, surface contaminants at connection points.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.

E. Make grounding and bonding connections using specified connectors.
    1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
    2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
    3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
    4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
    5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

F. Install in accordance with IEEE 142.

G. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

H. Install grounding and bonding conductors concealed from view.

I. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

J. Install continuous grounding using underground cold water system, driven rods and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.

K. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

L. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

M. Permanently attach equipment and grounding conductors prior to energizing equipment.

N. Common Ground Bonding with Lightning Protection System: Bond electric power system, grounding electrode system directly to lightning protection system earth connection at closest point to electric service grounding electrode. Use bonding conductor sized the same as system grounding conductor and install in conduit.

O. Identify grounding and bonding system components in accordance with Section 26 0553.

3.4 FIELD QUALITY CONTROL

A. See Division 01 - General Requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION – 26 05 26

26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for electrical equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements
B. Division 03 - Cast-in-Place Concrete: Concrete equipment pads.
C. Section 260400 – General Conditions for Electrical Trades
D. Section 260533 – Raceway and Boxes for Electrical Systems: Additional support and attachment requirements for conduits.
E. Section 265100 - Lighting: Additional support and attachment requirements for interior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
B. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. See Division 01: General Requirements.
B. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components being installed.
2. Coordinate the work with other trades and provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

C. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
D. Installer's Qualifications: Include evidence of compliance with specified requirements.
E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.
B. Comply with latest adopted version of applicable building code, including any addendum or supplements.
C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
D. Installer Qualifications for Field-Welding: As specified in Section 260400 General Requirements for Electrical Trades.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
  1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
  6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, fiberglass or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  1. Conduit Straps: One-hole or two-hole type; zinc plated steel.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
  3. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation
    b. Erico International Corporation
    c. O-Z/Gedney, a brand of Emerson Industrial Automation
    d. Thomas & Betts Corporation
    e. Substitutions: See Division 01 - General Requirements.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
  1. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation
    b. Erico International Corporation

    c. O-Z/Gedney, a brand of Emerson IndustrialAutomation
    d. Thomas & Betts Corporation
    e. Substitutions: See Division 01 - General Requirements.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  1. Comply with MFMA-4.
  2. Channel Material:
    a. Indoor Dry Locations: Use galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
  4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
  5. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation
    b. Thomas & Betts Corporation
    c. Unistrut, a brand of Atkore International Inc.
    d. Substitutions: See Division 01- General Requirements.
    e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
  1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2 inch diameter.
    b. Busway Supports: 1/2 inch diameter.
    c. Single Conduit up to 1 inch trade size: 1/4 inch diameter.
    d. Single Conduit larger than 1 inch trade size: 3/8 inch diameter.
    e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
    f. Outlet Boxes: 1/4 inch diameter.
    g. Luminaires: 1/4 inch diameter.

F. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
  1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
  4. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation
    b. Erico International Corporation
    c. PHP Systems/Design
    d. Unistrut, a brand of Atkore International Inc.
    e. Substitutions: See Division 01 - General Requirements.

G. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners may be used with:
    a. Permission by Architect.
    b. Permission by Structural Engineer.
    c. Use only threaded studs; do not use pins.
11. Hammer-driven anchors and fasteners are permitted as follows:
    a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
    b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
    d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Manufacturers - Mechanical Anchors:
    a. Hilti, Inc.
    b. ITW Red Head, a division of Illinois Tool Works, Inc.
    c. Powers Fasteners, Inc.
    d. Simpson Strong-Tie Company Inc.
    e. Substitutions: See Division 01 - General Requirements.
14. Manufacturers - Powder-Actuated Fastening Systems:
    a. Hilti, Inc.
    b. ITW Ramset, a division of Illinois Tool Works, Inc. Powers Fasteners, Inc.
    c. Simpson Strong-Tie Company Inc.
    d. Substitutions: See Division 01 - General Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.
B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
D. Unless specifically indicated, do not provide support from suspended ceiling support system or ceiling grid.
E. Unless specifically indicated, do not provide support from roof deck.
F. Do not penetrate, notch, or cut structural members without approval of Structural Engineer.
G. Equipment Support and Attachment:
  1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Division 03.
  5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: Also comply with Section 26 05 33.
I. Box Support and Attachment: Also comply with Section 26 05 33.
J. Luminaire Support and Attachment: Also comply with Section 26 51 00.
K. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
L. Secure fasteners according to manufacturer's recommended torque settings.
M. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. Division 01 - Quality Requirements, for additional requirements.
B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION – 26 05 29

26 05 33 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Conduit Applications
   2. General Requirements
   3. PVC-coated galvanized steel rigid metal conduit (RMC).
   4. Electrical metallic tubing (EMT).
   5. Rigid polyvinyl chloride (PVC) conduit.
   6. Wireway
   7. Boxes
   8. Accessories.

B. Related Sections:
   1. Section 260503 - Equipment Wiring Connections.
   2. Section 260519 – Electrical Power Conductors and Cables.
   3. Section 260526 - Grounding and Bonding for Electrical Systems.
   4. Section 260529 - Hangers and Supports for Electrical Systems.
   5. Section 260553 - Identification for Electrical Systems.
   6. Section 262726 - Wiring Devices.
   7. Section 270533 - Raceway and Boxes for Communications Systems.
   8. Section 280533 - Raceway and Boxes for Electronic Safety and Security.

1.2 REFERENCES

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC);
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S);
C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A);
D. NECA 1 - Standard for Good Workmanship in Electrical Construction;
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT);
F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit;
G. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC);
H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable;
I. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit;

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit;
K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing;
L. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT);
M. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
N. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
O. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
Q. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
S. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
T. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
U. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
V. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
W. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
X. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
Y. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
Z. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
AA. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
BB. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
CC. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.3 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
  1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
  1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for all conduits and fittings outlined in Part 2.
C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
D. Shop Drawings:
  1. Indicate proposed arrangement for conduits to be installed within or under structural concrete slabs, where permitted.
  2. Include proposed locations of roof penetrations and proposed methods for sealing.

E. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs (where permitted), and conduits 2 inch trade size and larger.
F. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
G. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Division 01 – General Requirements.
  2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General Requirements

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

D. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

1.8 COORDINATION

A. See Division 01 – General Requirements

B. Coordinate installation of outlet boxes for equipment connected under Section 260503.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

D. Electrical contractor is responsible to fully coordinate with the site and concrete contractors and all other trades when routing conduit underslab. Routing of conduit underslab may be acceptable, provided spacing of conduits is adequate for proper backfilling of area surrounding conduits. Adequate spacing shall mean using factory made conduit spacers that allow for a minimum of 3-inches for backfilling with sand or 3 times the pipe diameter for backfilling with a structural fill. Proposed conduit routing, installation and methods and backfilling procedures shall be submitted to the Engineer for review prior to installation.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

C. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications listed below. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

1. Underground:
    - a. Under Slab on Grade: Use schedule 40 rigid PVC conduit with galvanized steel rigid metal conduit sweeps. Provide cast metal boxes or nonmetallic handhole. Applications limited to:
        - 1) Panelboard feeders
        - 2) Floor boxes
        - 3) Free-standing equipment
    - b. Exterior, Within Trench: Use schedule 40 or schedule 80 rigid PVC conduit with galvanized steel rigid metal conduit sweeps. Provide cast metal boxes or nonmetallic handhole.
    - c. Exterior, Concrete Encased: Use Type EB rigid PVC conduit. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
2. Embedded Within Concrete:
    - a. Within Slab on Grade: Floor box applications only.
    - b. Within Slab Above Ground: Not permitted.
    - c. Within Concrete Walls Above Ground: Use Type EB rigid PVC conduit. Provide flush mounted box rated for masonry applications.
3. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT). Provide flush mounted boxes rated for masonry applications.
4. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT) or MC cable (where allowed).Provide flush mounted sheet-metal boxes.
5. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT) or MC cable (where allowed).
6. Interior, Damp or Wet Locations Provide:
    - a. Rigid steel conduit
    - b. Electrical metallic tubing (EMT) with compression fittings
    - c. Schedule 40 PVC conduit
    - d. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
7. Exposed, Interior dry locations: Use electrical metallic tubing (EMT)
8. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
    - a. Locations subject to physical damage include, but are not limited to:

        1) Where exposed below 8 feet, except within electrical and communication rooms or closets.
        2) Where exposed below 20 feet in warehouse areas.
    9. Exposed, Exterior: Use galvanized steel rigid metal conduit
    10. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit. Use sealing fittings appropriate for classification where installed.
    11. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
        a. Maximum Length: 6 feet.
    12. Connections to Vibrating Equipment:
        a. Dry Locations: Use flexible metal conduit or MC Cable.
        b. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
        c. Maximum Length: 6 feet unless otherwise indicated.
        d. Vibrating equipment includes, but is not limited to:
            1) Transformers.
            2) Motors.
            3) Pumps.
            4) Fans.
    13. Exposed Dry Finished Locations: Provide surface metal raceway and fittings. Unless specified on drawings, requires design team approval for use of surface metal raceway in finished locations. Coordinate all vertical runs of surface raceway with the architect prior to installation.

2.2 GENERAL REQUIREMENTS

A. Fittings for Grounding and Bonding: Also comply with Section 260526.
B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
C. Provide products listed, classified, and labeled as suitable for the purpose intended.
D. Minimum Conduit Size, Unless Otherwise Indicated:
    1. Branch Circuits: 3/4 inch trade size.
    2. Branch Circuit Homeruns: 3/4 inch trade size.
    3. Control Circuits: 1/2 inch trade size.
    4. Flexible Connections to Luminaires: 3/4 inch trade size.
    5. Underground, Interior: 1 inch trade size.
    6. Underground, Exterior: 1 inch trade size.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
    1. Allied Tube and Conduit.
    2. Western Tube and Conduit.
    3. Wheatland Tube Company.
    4. Substitutions: See Division 01 – General Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
  1. Manufacturers:
     a. Bridgeport Fittings Inc.
     b. O-Z/Gedney.
     c. Thomas & Betts Corporation.
     d. Substitutions: See Division 01 – General Requirements
  2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  4. Material: Use steel or malleable iron.
  5. Do not use die cast zinc fittings.
  6. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
  1. Allied Tube and Conduit.
  2. Western Tube and Conduit.
  3. Wheatland Tube Company.
  4. Substitutions: See Division 01 – General Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

D. Interior Coating: Urethane, minimum thickness of 2 mil.

E. PVC-Coated Fittings:
  1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
  2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
  3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  4. Material: Use steel or malleable iron.
  5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
  6. Interior Coating: Urethane, minimum thickness of 2 mil.

F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube and Conduit.
2. Western Tube and Conduit.
3. Wheatland Tube Company.
4. Substitutions: See Division 01 – General Requirements

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc
      b. O-Z/Gedney, a brand of Emerson Industrial Automation
      c. Thomas & Betts Corporation
      d. Substitutions: See Division 01 – General Requirements
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel.
   4. Connectors and Couplings: Use compression (damp or wet location)or set-screw type elsewhere

2.6 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
   1. Cantex Inc
   2. Carlon, a brand of Thomas & Betts Corporation
   3. JM Eagle
   4. Substitutions: See Division 01 – General Requirements

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.7 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
    1. Manufacturers:
        a. Cooper Crouse-Hinds, a division of Eaton Corporation
        b. Hubbell Incorporated; Bell Products
        c. Hubbell Incorporated; RACO Products
        d. Leviton
        e. O-Z/Gedney, a brand of Emerson Industrial Automation
        f. Thomas & Betts Corporation
        g. Substitutions: See Division 01 – General Requirements
    2. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
    3. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
    4. Use cast iron boxes or cast aluminum boxes with threaded hubs where exposed galvanized steel rigid metal conduit is used.
    5. Use cast aluminum boxes with threaded hubs where aluminum rigid metal conduit is used.
    6. Use nonmetallic boxes where exposed rigid PVC conduit is used.
    7. Use suitable concrete type boxes where flush-mounted in concrete.
    8. Use suitable masonry type boxes where flush-mounted in masonry walls.
    9. Use raised covers suitable for the type of wall construction and device configuration where required.
    10. Use shallow boxes where required by the type of wall construction.
    11. Do not use "through-wall" boxes designed for access from both sides of wall.
    12. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
    13. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
    14. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
    15. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
    16. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
    17. Minimum Box Size, Unless Otherwise Indicated:
        a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep trade size.
        b. Communications Systems Outlets:
            1) Minimum 4 inch square by 2-1/8 inch trade size.
            2) Provide with single-gang drywall ring.
            3) Comply with Section 27 0533.
        c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep trade size.
    18. Wall Plates: Comply with Section 26 2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches :
  1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches :
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
    d. Provide with grounding stud.
    e. Provide with document pocket in cover.
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation
    b. Hoffman, a brand of Pentair Technical Products
    c. Hubbell Incorporated; Wiegmann Products
    d. Substitutions: See Division 01 – General Requirements

D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
  1. Manufacturers:
    a. Appleton, a brand of Emerson Industrial Automation
    b. Cooper Crouse-Hinds, a division of Eaton Corporation
    c. Hubbell Incorporated; Killark Products
    d. Substitutions: See Division 01 – General Requirements
  2. Provide outlet boxes and sealing fittings that comply with Article 501 of the NEC based on the classification of the area.

E. Underground Boxes/Enclosures:
  1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
  4. Provide logo on cover to indicate type of service.
  5. Applications:
    a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.

        b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 22 load rating.
        c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
    6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
        a. Manufacturers:
            1) Hubbell Incorporated; Quazite Products
            2) NewBasis
            3) MacLean Highline
            4) Substitutions: See Division 01 – General Requirements
        b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

2.8 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
E. Mechanical Sleeve Seals
    1. Manufacturers:
        a. Thunderline Link-Seal, Inc.
        b. NMP Corporation.
        c. PSI Link-Seal.
    2. Substitutions: See Division 01 – General Requirements
    3. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
    4. Use: Provide for all penetrations through foundation walls.

PART 3 EXECUTION

3.1 EXAMINATION

A. See Division 01 – General Requirements.
B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

C. Verify that field measurements are as shown on drawings.
D. Verify that mounting surfaces are ready to receive conduits.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 260526.
B. Fasten raceway and box supports to structure and finishes in accordance with Section 260529.
C. Identify raceway and boxes in accordance with Section 260553.
D. Arrange raceway and boxes to maintain headroom and present neat appearance.
E. Install products in accordance with manufacturer's instructions.
F. Perform work in accordance with NECA 1 (general workmanship).
G. Conduit Routing:
    1. Unless dimensioned, conduit routing indicated is diagrammatic.
    2. When conduit destination is indicated and routing is not shown, determine exact routing required.
    3. Conceal all conduits unless specifically indicated to be exposed.
    4. Unless otherwise approved, do not route conduits exposed:
        a. Across floors.
        b. Across roofs.
        c. Across top of parapet walls.
        d. Across building exterior surfaces.
        e. Interior finished spaces.
    5. Conduits installed underslab or embedded in concrete (see section 2.1 where applicable) may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
    6. Arrange conduit to maintain adequate headroom, clearances, and access.
    7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
    8. Arrange conduit to provide no more than 150 feet between pull points.
    9. Route conduits above water and drain piping where possible.
    10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
    11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
    12. Maintain minimum clearance of 12 inches between conduits and surfaces exceeding 104 degrees F. This includes, but is not limited to:
        a. Heaters.
        b. Hot water piping.
        c. Flues.

13. Group parallel conduits in the same area together on a common rack.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
   5. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
   9. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
   10. Use of spring steel conduit clips for support of conduits is not permitted.
   11. Use of wire for support of conduits is not permitted.

I. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs 6” above finished floor.
   7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

J. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.

    5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
    6. Provide suitable mechanical sleeve seals where conduits penetrate exterior wall below grade.
    7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
    8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
    9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
    10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07 Section 07 8400.

K. Underground Installation:
    1. Provide trenching and backfilling in accordance with Division 31.
    2. Provide trenching and backfilling in accordance with Division 31.
    3. Minimum Cover, Unless Otherwise Indicated or Required:
        a. Underground, Exterior: 24 inches.
        b. Under Slab on Grade:
            1) Minimum 12 inches to bottom of slab.
            2) Depth as required to allow conduit to penetrate perpendicular to slab
    4. Provide underground warning tape (exterior below grade) in accordance with Section 260553 along entire conduit length except where concrete-encased.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Division 03 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

M. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
    1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
    2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
    3. Where conduits are subject to earth movement by settlement or frost.

O. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
    1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
3. Where conduits penetrate coolers or freezers.

P. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
Q. Provide grounding and bonding in accordance with Section 260526.
R. Identify conduits in accordance with Section 260553.
S. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
T. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

3.3 INSTALLATION – BOXES

A. Install products in accordance with manufacturer's instructions.
B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Provide separate boxes for emergency power and normal power systems.
E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
H. Install gang box with plaster ring for single device outlets.
I. Box Locations:
    1. Locate boxes to be accessible. Provide access panels in accordance with Division 08 as required where approved by the Architect.
    2. Unless dimensioned, box locations indicated are approximate.
    3. Locate boxes as required for devices installed under other sections or by others.
        a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
        b. Communications Systems Outlets: Comply with Section 270533.

4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260534.

J. Box Supports:
    1. Secure and support boxes in accordance with NFPA 70 and Section 260529.
    2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
    3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
    4. Install stamped steel bridges to fasten flush mounting outlet box between studs.
    5. Install adjustable steel channel fasteners for hung ceiling outlet box.

K. Install boxes plumb and level.
L. Flush-Mounted Boxes:
    1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
    2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
    3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

M. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Division 03.
N. Install boxes as required to preserve insulation integrity.

O. Underground Boxes/Enclosures:
   1. Install enclosure on gravel base, minimum 6 inches deep.
   2. Flush-mount enclosures located in concrete or paved areas.
   3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
   4. Provide cast-in-place concrete collar constructed in accordance with Division 03, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
   5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

P. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
R. Close unused box openings.
S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
T. Provide grounding and bonding in accordance with Section 260526.
U. Identify boxes in accordance with Section 260553.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Locate outlet boxes to allow luminaires positioned as indicated on reflected ceiling plan.
B. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.5 ADJUSTING

A. See Division 01 – General Requirements Adjust flush-mounting outlets to make front flush with finished wall material.
B. Install knockout closures in unused openings in boxes.

3.6 CLEANING

A. See Division 01 – General Requirements
B. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.
C. Clean exposed surfaces and restore finish.

3.7 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION – 26 05 33

26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.
B. Identification nameplates and labels.
C. Wire and cable markers.
D. Voltage markers.
E. Underground warning tape.
F. Floor marking tape.
G. Warning signs and labels.

1.2 RELATED REQUIREMENTS (follow the most currently adopted amended version)

A. See Division 01 – General Requirements
B. Division 09 - Finishes.
C. Section 260400 – General Conditions for Electrical Trades.
D. All of Divisions 26, 27 & 28.

1.3 REFERENCE STANDARDS (follow the most currently adopted amended version)

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.
B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.
C. NFPA 70 - National Electrical Code.
D. NFPA 70E - Standard for Electrical Safety in the Workplace
E. UL 969 - Marking and Labeling Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
  1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Division 01- General Requirements
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General Requirements
B. Accept identification products on site in original containers. Inspect for damage.
C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.8 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature and humidity is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
  1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    a. Panelboards:
      1) Identify panel name.
      2) Identify ampere rating.

        3) Identify voltage and phase.
        4) Identify power source and circuit number. Include location when not within sight of equipment.
        5) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
        6) Use typewritten circuit directory to identify load(s) served for panelboards with a door, including spares and spaces
    b. Enclosed switches, circuit breakers, and motor controllers:
        1) Identify voltage and phase.
        2) Identify power source and circuit number. Include location when not within sight of equipment.
        3) Identify load(s) served. Include location when not within sight of equipment.
    c. Electricity Meters:
        1) Identify load(s) metered.
2. Service Equipment:
    a. Use identification nameplate to identify each service disconnecting means.
    b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Emergency System Equipment:
    a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
    b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
    c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
6. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
7. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
8. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
9. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
10. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
11. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

        a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Division 09.

12. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
13. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    a. Minimum Size: 3.5 by 5 inches.
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    c. Service Equipment: Include the following information in accordance with NFPA 70.
        1) Nominal system voltage.
        2) Available fault current.
        3) Clearing time of service overcurrent protective device(s).
        4) Date label applied.
14. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
15. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
16. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
17. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Identification for Communications Conductors and Cables: Comply with Section 270553.

3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    a. At each source and load connection.
    b. Within boxes when more than one circuit is present.
    c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
    d. In cable tray, at maximum intervals of 20 feet.
5. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
6. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
    a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
        1) Color Code:
            a) Emergency Power System: Red.
                (1) Life Safety Branch: YELLOW.
                (2) Critical Branch: RED.
                (3) Equipment Branch: GREEN.
            b) Fire Alarm System: Red.
        2) Field-Painting: Comply with Division 09.
        3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
5. Use underground warning tape to identify underground raceways.
6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
    a. Color-Coded Boxes: Field-painted in accordance with Division 09 per the same color code used for raceways.
        1) Emergency Power System: Red.

            (1) Life Safety Branch: YELLOW.
            (2) Critical Branch: RED.
            (3) Equipment Branch: GREEN.
        2) Fire Alarm System: Red.
    b. For exposed boxes in public areas, do not color code.
3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    a. For exposed boxes in public areas, use only identification labels.
4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 270553.
2. Wiring Device and Wallplate Finishes: Comply with Section 262726.
3. Factory Pre-Marked Wallplates: Comply with Section 262726.
4. Use identification label to identify fire alarm system devices.
    a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
5. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
    a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
6. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
7. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

F. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Manufacturers:
    a. Brimar Industries, Inc.
    b. Kolbi Pipe Marker Co.
    c. Seton Identification Products
    d. Substitutions: Division 01 - General Requirements.
2. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
  1. Manufacturers:
    a. Brady Corporation
    b. Brother International Corporation
    c. Panduit Corp.
    d. Substitutions: Division 01 - General Requirements.
  2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    a. Use only for indoor locations.
  3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
  1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend:
    a. System designation where applicable:
      1) Emergency Power System: Identify with text "EMERGENCY".
      2) Life Safety Branch: Identify with text "LIFE SAFETY"
      3) Critical Branch: Identify with text "CRITICAL"
      4) Equipment Branch: Identify with text "EQUIPMENT"
      5) Fire Alarm System: Identify with text "FIRE ALARM".
    b. Equipment designation or other approved description.
    c. Other information as indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    a. System Designation: 1 inch.
    b. Equipment Designation: 1/2 inch.
    c. Other Information: 1/4 inch.
    d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
  5. Color:
    a. Normal Power System: White text on black background.
    b. Emergency Power System: White text on red background.
      1) Life Safety Branch: White text on YELLOW background.
      2) Critical Branch: White text on RED background.
      3) Equipment Branch: White text on GREEN background.
    c. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
  1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.
    a. Exceptions:
        1) Provide white text on red background for general information or operational instructions for emergency systems.
        2) Provide white text on red background for general information or operational instructions for fire alarm systems.

E. Format for Caution and Warning Messages:
    1. Minimum Size: 2 inches by 4 inches.
    2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
    3. Text: All capitalized unless otherwise indicated.
    4. Minimum Text Height: 1/2 inch.
    5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
    1. Minimum Size: 3/8 inch by 1.5 inches.
    2. Legend: Power source and circuit number or other designation indicated.
        a. Include voltage and phase for other than 120 V, single phase circuits.
    3. Text: All capitalized unless otherwise indicated.
    4. Minimum Text Height: 3/16 inch.
    5. Color: Black text on clear background.

G. Format for Control Device Identification:
    1. Minimum Size: 3/8 inch by 1.5 inches.
    2. Legend: Load controlled or other designation indicated.
    3. Text: All capitalized unless otherwise indicated.
    4. Minimum Text Height: 3/16 inch.
    5. Color: Black text on clear background.

H. Format for Fire Alarm Device Identification:
    1. Minimum Size: 3/8 inch by 1.5 inches.
    2. Legend: Designation indicated and device zone or address.
    3. Text: All capitalized unless otherwise indicated.
    4. Minimum Text Height: 3/16 inch.
    5. Color: Red text on white background.
    6.

2.3 WIRE AND CABLE MARKERS

A. Manufacturers:
    1. Brady Corporation
    2. HellermannTyton
    3. Panduit Corp.
    4. Substitutions: Division 01 - General Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

    1. Do not use self-adhesive type markers.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
D. Legend: Power source and circuit number or other designation indicated.
E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
    1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.
G. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

A. Manufacturers:
    1. Brady Corporation
    2. Brimar Industries, Inc.
    3. Seton Identification Products
    4. Substitutions: Division 01 - General Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
D. Minimum Size:
    1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
    2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
    3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
    4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

E. Legend:
    1. Markers for Voltage Identification: Highest voltage present.
    2. Markers for System Identification:
        a. Emergency Power System: Text "EMERGENCY".
        b. Other Systems: Type of service.

F. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

A. Manufacturers:
    1. Brady Corporation
    2. Brimar Industries, Inc.
    3. Seton Identification Products

4. Substitutions: Division 01 - General Requirements.

B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
   1. Tape for Buried Power Lines: Black text on red background.
   2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 WARNING SIGNS AND LABELS

A. Manufacturers:
   1. Brimar Industries, Inc.
   2. Clarion Safety Systems, LLC.
   3. Seton Identification Products
   4. Substitutions: Division 01 - General Requirements.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
      a. Do not use labels designed to be completed using handwritten text.
      b. Provide polyester overlaminate to protect handwritten text.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conduits: Legible from the floor.
   8. Boxes: Outside face of cover.
   9. Conductors and Cables: Legible from the point of access.
   10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.
D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
   1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
F. Install underground warning tape above buried lines with one tape per trench at 12 inches below finished grade.
G. Secure rigid signs using stainless steel screws.
H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Division 01 - General Requirements.
B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION – 26 05 53

26 09 23 LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General Requirements
   2. Lighting Contactors
   3. Line Voltage Switches
   4. Switch Plates.
   5. Line Voltage Occupancy/Vacancy Sensor Switches
   6. Low Voltage Occupancy/Vacancy Sensors
   7. Photocells
   8. Room Controllers / Power Packs
   9. Low Voltage Keypads / Switches.
   10. Class 2 Conductors and Cables

B. Related Sections:
   1. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.
   2. Section 26 05 19– Electrical Power Conductors and Cables.
   3. Section 26 05 33 - Raceway and Boxes for Electrical Systems: Product requirements for raceway and boxes for placement by this section.
   4. Section 26 05 53 - Identification for Electrical Systems: Product requirements for electrical identification items for placement by this section.
   5. Section 26 24 16 - Panelboards.
   6. Section 26 27 26 - Wiring Devices: Product requirements for wiring devices for placement by this section.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
   2. NEMA FU 1 - Low Voltage Cartridge Fuses.
   3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
   4. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.
   5. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
   6. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
   7. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
   8. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
   9. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2015.

B. 47 CFR 15 - Radio Frequency Devices; current edition.

C. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.
D. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2004 (R2010).
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
I. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
J. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
K. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
M. IECC – International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SYSTEM DESCRIPTION

A. IECC compliant lighting controls to control all interior and exterior lighting:
   1. Standalone lighting controls in individual spaces consisting of some combination of occupancy sensors, vacancy sensors, photocells, power packs, low voltage switches and low voltage switches with dimming capability.
   2. Standalone microprocessor based controllers with distributed switching control using self-contained individually mounted lighting relays. Provides multiple modes of operation incorporating vacancy sensors, photocells and low voltage control stations.

B. Refer to lighting control details and riser diagrams on the drawings for additional information.
C. Provide automatic shutoff for lighting inside building, where required. Control shutoff by method conforming to IECC.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall switches with actual installed door swings and sidelights.
3. Coordinate the placement of wall switch occupancy/vacancy sensors with actual installed door swings and sidelights.
4. Coordinate the placement of occupancy/vacancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
5. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Protect lighting control devices during construction.
   2. Clean lighting control devices once final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Division 01 - General Requirements.

B. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.
   1. One Line Diagram: Indicating system configuration, panels, number and type of switches or devices.
   2. Include typical wiring diagrams for each component.
   3. Floor Plan Layout Drawings: Manufacturers symbols are acceptable, provided that symbology between engineer’s device legend and manufacturers symbols are cross-referenced.

C. Product Data: Submit manufacturer’s standard product data for each system component. This shall include, but not be limited to: ratings, configurations, dimensions, sensor coverage ranges, colors, service condition requirements, and installation features.

D. Manufacturer's Installation Instructions: Submit for each system component.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections and evidence that the control schemes identified herein and shown on the typical lighting control details are configured and operational as specified.
   1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
   2. Provide documentation addressing each room/area control scheme specified with a description of how the submitted system complies.

1.6 CLOSEOUT SUBMITTALS

A. See Division 01 - General Requirements

B. Project Record Documents: Record the following information:

   1. Actual installed locations of components and settings for lighting control devices. Record circuiting and switching arrangements.
   2. Wiring diagrams reflecting field-installed conditions with identified and numbered system components and devices.

C. Operation and Maintenance Data:

   1. Submit replacement parts numbers.
   2. Submit manufacturer’s published installation instructions and operating instructions.
   3. Recommended renewal parts list.
   4. Detailed information on device programming and setup.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience. Company shall provide 24/7 telephone support by qualified technicians.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

C. Installer Qualifications: Installer shall be one who is experienced in performing the work of this section, and who has specialized in installation of work similar to that required for this project.

D. Contractor shall ensure that lighting system control devices and assemblies are fully compatible and can be integrated into a system that operates as described in the lighting control notes on drawings and as described within this specification. Any incompatibilities between devices, assemblies, and system controllers shall be resolved between the contractor and the system provider, as required to ensure proper system operation and maintainability.

E. Performance Requirements: Shall provide all system components that have been manufactured, assembled, and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

F. Performance Testing Requirements

   1. Manufacturer shall 100% test all equipment prior to shipment. Sample testing is not acceptable.

G. Code Requirements

   1. System Control Unit and System Field Devices shall be UL listed and certified.
   2. All system components shall be FCC / IC compliant.

3. All system components shall be installed in compliance with National Electrical Codes.
4. Building Codes: All units shall be installed in compliance with applicable, local building codes.

1.8 PRE-INSTALLATION MEETINGS

A. See Division 01 - General Requirements.
B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 - General Requirements.
B. Accept components on site in manufacturer’s packaging. Inspect for damage.
C. Protect components by storing in manufacturer’s containers indoor protected from weather.

1.10 WARRANTY

A. See Division 01 - General Requirements.
B. Furnish five year manufacturer warranty for all components.

1.11 EXTRA MATERIALS

A. See Division 01 - General Requirements Furnish two of each switch type.
B. Furnish two of each occupancy/vacancy sensor type.
C. Furnish two of each power pack type.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES – GENERAL REQUIREMENTS

A. Manufacturers:
    1. nLight
    2. Hubbell
    3. Crestron
    4. Cristal Controls
    5. Substitutions: See Division 01 – General Requirements.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

D. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

E. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

F. Refer to lighting control details on drawings for additional requirements and product specifications.

2.2 LINE VOLTAGE SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated
   2. Leviton Manufacturing Co., Inc.
   3. Pass and Seymour/Legrand
   4. Substitutions: [Division 01 - General Requirements] [Not Permitted].

B. Line Voltage Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. Body and Handle finish: Color selection by Architect.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

2.3 SWITCH PLATES

A. Manufacturers:
   1. Hubbell Incorporated
   2. Leviton Manufacturing Co., Inc.
   3. Pass and Seymour/Legrand
   4. Substitutions: Division 01 - General Requirements.
      a. Where low voltage keypads / switches or line voltage sensor switches are shown, provide switch plate by same manufacturer.

B. Product Description: Specification Grade.
   1. Material: Plastic.
   2. Color: By Architect.

2.4 LOW VOLTAGE OCCUPANCY/VACANCY SENSORS

A. Manufacturers: See Paragraph 2.1(A)

B. Product Description: Factory-assembled commercial grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated. Mounting as indicated on floor plans.

C. Sensor Requirements:
  1. Sensor Technology:
    a. Sensor shall be Dual Technology, unless otherwise noted on drawings. Available sensor technologies:
      1) Passive Infrared/Ultrasonic Dual Technology Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
      2) Passive Infrared/Acoustic Dual Technology Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
  2. Sensor shall be set to:
    a. Auto-ON, Auto-OFF mode (Occupancy Sensor)
    b. Manual-ON, Auto-OFF mode (Vacancy Sensor)
    c. Dipswitch selectable to toggle between occupancy and vacancy mode.
  3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  4. Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  5. Passive Infrared Lens Field of View: Field customizable to block motion detection in selected areas.
  6. Sensor shall be capable of turning lights OFF after 20 minutes of inactivity. Switch shall also adjustable overrides.
  7. Sensitivity: Field adjustable.
  8. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
  9. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
  10. Coverage:
    a. Small Space (< 500 Sq Ft): 500 square feet minimum
    b. Medium Space (500-1000 Sq Ft): 1,000 square feet minimum
    c. Large Space (>1000 Sq Ft): 2,000 square feet minimum. Multiple sensors where shown on the plans.
  11. Furnish with power pack or room controller by same manufacturer.
    a. Provide for zone control and maximum number of sensors connected to power pack per manufacturer’s requirements.
    b. Provide room controller with functions and quantity of zones as indicated on drawings and as required per manufacturer. Refer to Paragraph 2.9 for additional information.
  12. Operation: Silent.

D. Room Sensor Type: As indicated on Drawings.

E. High Bay areas: For areas with ceilings more than 15 feet above finished floor, provide high-bay ceiling mounted occupancy sensor. Refer to lighting control details for product specification.

2.5 POWER PACKS

- A. Manufacturers: See Paragraph 2.1(A)
- B. Refer to lighting control details on drawings for types, configurations, performance requirements, and additional information.
- C. Description: Integrated lighting, dimming, and equipment switching control system for mounting in a concealed space, enclosure shall be plenum rated. Provide pre-configured lighting controller(s), with capabilities for manual setup, and software setup through programming port, configured as a standalone controller.
- D. Magnetic low voltage.
  - 1. Electronic low voltage.
  - 2. LED

- E. Receptacle/Plug Loads.
  - 1. 120 VAC, 20A general purpose rating.

- F. General Requirements:
  - 1. Power Packs:
    - a. Main Power: 100 – 277 VAC, 50/60 Hz.
    - b. Input/Output (Refer to Drawings and Details for Input/Output Applicable to Project):
      - 1) Line Power Inputs: 1.
      - 2) Switch Channel Outputs: 1 or 2.
      - 3) 0 – 10V Dimmer Outputs: 1 - Class 1 or Class 2.
      - 4) Auxiliary Relay for Interface with Other Systems.
      - 5) Auxiliary Inputs: Hold On/Hold Off as specified.
    - c. Enclosure: Plenum rated, surface-mounted industrial control enclosure mounts directly to electrical junction box.

2.6 LOW VOLTAGE KEYPADS / SWITCHES

- A. Provide low voltage keypads / switches with configuration, functionality and operation as indicated on drawings.
- B. General Requirements:
  - 1. Custom engravable buttons/switches, refer to drawings for labeling. Refer to Paragraph C below for additional requirements.
  - 2. Quantity and function as indicated on drawings.
  - 3. LED indicators, as shown on drawings.
  - 4. Configured to fit in standard gang boxes.
  - 5. Color: By Architect

- C. Labeling:
  - 1. Provide factory engraved labels for all low voltage keypads / switches buttons.
  - 2. Refer to lighting control details on drawings for suggested labeling of lighting control equipment. Coordinate naming of scenes/control zones with the Owner.

Provide a worksheet listing remote keypad controls, labeling requests and locations to the Owner for their labeling requests.

3. Do not order labels until Owner coordination is complete.

D. Lighting keypad shall be provided by the same manufacturer as the lighting control system.

2.7 PHOTOCELLS

A. Manufacturers: See Paragraph 2.1(A)

B. Product Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls. Sensor mounted as indicated on Drawings with separate control-calibration module. Control unit powered by 24 VAC.

C. Control-Calibration Module: Furnish with the following:
  1. Capable of being switched between multiple measurement ranges.
  2. Separate trip points for high and low response settings.
  3. Three-minute time delay between switching outputs to avoid nuisance tripping.

D. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
  1. Sensor Type: Photodiode with diffusing lens
  2. Sensor Range:
    a. Outdoor Photo Sensors: 5 to 250 footcandles (53.8 to 2690 lx).
    b. Open Loop Photo Sensors: 3 to 6,000 footcandles (32.3 to 64,580 lx).
  3. Finish: White unless otherwise indicated.

E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.

2.8 CLASS 2 CONDUCTORS AND CABLES

A. General Requirements:
  1. Line Voltage Wiring: Comply with requirements of Division 26 Section "Electrical Power Conductors and Cables".
  2. Class 2 Low-Voltage Cable:
    a. Provide plenum-rated cable.
    b. UTP Cable: CAT 5, CAT 6, or as required by manufacturer:
      1) Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
      2) All cabling shall meet or exceed Commercial Building Telecommunications Cabling Standard ANSI/TIA/EIA 568-C.2
      3) Cabling shall use 23AWG minimum conductors.

        4) Pulling tension: The cable pulling tension shall not exceed 25 ft/lbs as indicated in TIA/EIA-568-A.
    c. Control Cable:
        1) Stranded copper cable, Type CMP.
            a) Multiple-Conductor.
            b) Twisted Pair.
            c) Shielded Twisted Pair
            d) Minimum AWG: Per manufacturer requirements, as shown on drawings and details.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification:
    1. Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instruction.
    2. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
    3. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
    4. Verify that final surface finishes are complete, including painting.
    5. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
    6. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
    7. Verify that conditions are satisfactory for installation prior to starting work.

B. Inspection: Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. The Electrical Contractor, as part of the work of this section, shall coordinate, receive, mount, connect, and place into operation all equipment. The Electrical Contractor shall furnish all conduit, wire, connectors, hardware, and other incidental items necessary for properly functioning lighting control as described herein and shown on the plans (including but not limited to System Field Devices, 0-10V dimming ballasts, fixed output ballasts, 0-10V LED drivers and communication wire). The Electrical Contractor shall maintain performance criteria stated by manufacturer without defects, damage, or failure.

B. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards, unless otherwise indicated. Install per manufacturer’s instructions.

C. Power: The contractor shall test that all branch load circuits are operational before connecting loads to sensor system load terminals, and then de-energize all circuits before installation.

D. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

E. Install wiring in accordance with Section 260519 and paragraph 2.13.

F. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings. Install wire in conduit in accordance with Section 260533 and paragraph 2.13.

G. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

H. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to indicate originating panel designation.

I. Label each low voltage wire with relay number at each switch or sensor. Refer to Section 26 05 53.

J. Coordinate locations of outlet boxes provided under Section 260533 as required for installation of lighting control devices provided under this section.

K. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

L. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors shall not have direct view of luminaries.

M. Prior to setting scenes or zones dependent on furniture placement, whiteboard locations, projection screen locations, lectern locations or similar, coordinate with the Owner, Architect and red-lined furniture plans. Make all required adjustments during construction.

N. Systems Integration:
    1. Equipment Integration Meeting:
        a. Facility Representative to coordinate meeting between Facility Representative, Lighting Control System Manufacturer and other related equipment manufacturers to discuss equipment and integration procedures prior to system startup

O. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
P. Install lighting control devices plumb and level, and held securely in place.
Q. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
R. Identify lighting control devices in accordance with Section 260553.
S. Unless otherwise indicated, install power packs/room controllers for lighting control devices within the same space above accessible ceiling or above access panel in inaccessible ceiling.
T. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

3.4 SENSOR INSTALLATION:

A. Adjust sensitivity to cover area installed
B. Set time delay on sensors that are connect to the lighting control system to the minimum. Time delay to off shall be set to no longer than 20 minutes.
C. Provide vacancy sensor configurations as indicated on drawings.
D. Install sensors on vibration free stable surface.
E. Install atrium and skylight light sensor facing toward window or skylight.
F. Install interior light sensor in ceiling facing the floor.
G. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
H. Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
I. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors away from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
J. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on sensor lenses to block undesired motion detection.

3.5 MANUFACTURER'S FIELD SERVICES

A. Division 01 - General Requirements.

B. Manufacturer’s Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following field tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing wall stations and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
4. Test outdoor photo controls to verify proper operation, including time delays where applicable. Record test results in written report to be included with submittals.
5. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
6. Adjust relay panel settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings and as-built relay panel schedules in written report, to be included with submittals.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

3.6 FIELD QUALITY CONTROL

A. Division 01 - General Requirements.

B. Inspect each lighting control device for damage and defects.

C. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.7 ADJUSTING

A. Division 01 - General Requirements.

B. Test contactors and switches after installation to confirm proper operation.

C. Confirm correct loads are recorded on directory card in each panel.

D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.8 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.9 COMMISSIONING

A. Division 01 - General Requirements.

3.10 DEMONSTRATION

A. Division 01 - General Requirements.
B. Demonstrate proper operation of lighting control devices to Architect and Owner, and correct deficiencies or make adjustments as directed.
C. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
    1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
    2. Provide minimum of four hours of training.
    3. Schedule training with Owner, provide at least 7 days notice to Architect/Engineer of training date.
    4. Instructor: Qualified manufacturer’s representative familiar with the project and with sufficient knowledge of the installed lighting control devices.

D. Training shall include, but not be limited to, the following procedures:
    1. Programming and adjusting time schedules associated with timeclocks and relay panels, where such products exist in the project.
    2. Programming and adjusting time delay, default light levels and other functions of standalone wall sensors and low voltage room controller systems.
    3. Modifying scenes and zone control of room controllers and power packs, including programming, adjusting and pairing of low voltage keypads/switch buttons associated with zones or scenes.
    4. Programming and adjusting internal luminaire-level occupancy sensors and photocells, where such products exist in the project.

END OF SECTION – 26 09 23

26 24 16 PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Lighting and appliance panelboards.
B. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements.
B. Division 03 - Cast-in-Place Concrete: Concrete equipment pads.
C. Section 260526 - Grounding and Bonding for Electrical Systems.
D. Section 260529 - Hangers and Supports for Electrical Systems.
E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service..
B. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction.
D. NEMA FU 1 – Low Voltage Cartridge Fuses.
E. NECA 407 - Standard for Installing and Maintaining Panelboards.
F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
H. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).
I. NEMA PB 1 - Panelboards.
J. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems
L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
M. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
N. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
O. UL 67 - Panelboards; Current Edition, Including All Revisions.
P. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
Q. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
R. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
S. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

T. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
U. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
  1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
    1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
    2. Include wiring diagrams showing all factory and field connections.
    3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
    4. Include documentation of listed series ratings upon request.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
E. Field Quality Control Test Reports.
F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Division 01 - Product Requirements, for additional provisions.
    2. Panelboard Keys: Two of each different key.
    3. See Section 262813 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
    1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
    2. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE.

B. Eaton Corporation.

C. Schneider Electric; Square D Products.

D. Siemens Industry, Inc.

E. Substitutions: See Division 01 - Product Requirements.

F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
    1. Altitude: Less than 6,600 feet.
    2. Ambient Temperature:
        a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
        b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F

C. Short Circuit Current Rating:

    1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
    2. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
    3. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
    4. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
    1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
    2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
    3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
    4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.
I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
    1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
        a. Indoor Clean, Dry Locations: Type 1.
    2. Outdoor Locations: Type 3R.
        a. Furnish thermostatically controlled electric heaters sized to prevent condensation under expected weather conditions at Project site. Furnish control power transformer and terminals for separate connection of heater power circuit.
        b.
    3. Boxes: Galvanized steel unless otherwise indicated.
        a. Provide wiring gutters sized to accommodate the conductors to be installed.
        b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
        c. Provide removable end walls for NEMA Type 1 enclosures.
        d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.

4. Fronts:
    a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
5. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided, list and label panelboards as a complete assembly including surge protective device.

L. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
1. Ampere Rating: Not less than ampere rating of panelboard bus.
2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
3. Coil Voltage: As required for connection to control system indicated.

M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
    a. Use zero sequence ground fault detection method unless otherwise indicated.
    b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
    c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

N. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

O. Selective Coordination:
1. Fusible branch circuit panelboards overcurrent protective devices shall be selectively coordinated with all supply side (fed from both the normal and emergency source) overcurrent protective devices. Provide recommended fuses from a single manufacturer to maintain published minimum ampere coordination ratios.

P. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

Q. Load centers are not acceptable.

R. Provide the following features and accessories where indicated or where required to complete installation:
  1. Feed-through lugs.
  2. Sub-feed lugs.

2.3 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
  1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
  1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  2. Phase and Neutral Bus Material: Tin plated copper.
  3. Ground Bus Material: Copper.
  4. Terminations: 75°C.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
  1. Provide surface-mounted or flush-mounted enclosures as indicated.
  2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  3. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  4. Provide clear plastic circuit directory holder mounted on inside of door.

F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
  1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  2. Interrupting Capacity:
    a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

        2) 14,000 rms symmetrical amperes at 480 VAC.
    b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
    c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
    a. Provide mechanical lugs unless otherwise indicated.
    b. Provide compression lugs where indicated.
    c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
    a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
    b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Where indicated on drawings, furnish solid state, microprocessor-based, true rms sensing trip units.
    a. Provide the following field-adjustable trip response settings:
        1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
        2) Long time delay.
        3) Short time pickup and delay.
        4) Instantaneous pickup.
        5) Ground fault pickup and delay where ground fault protection is indicated.
    b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
    c. Provide communication capability where indicated: Compatible with system indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
    a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
    b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
    c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
    d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
    e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
10. Do not use tandem circuit breakers.
11. Do not use handle ties in lieu of multi-pole circuit breakers.
12. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
13. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
    c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
    d. Under-voltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
    e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.5 SOURCE QUALITY CONTROL

A. See Division 01 – General Requirements.
B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive panelboards.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
E. Provide required supports in accordance with Section 260529.
F. Install panelboards plumb.
G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Division 03.
J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
K. Provide grounding and bonding in accordance with Section 260526.
    1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
    2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

L. Install all field-installed branch devices, components, and accessories.
M. Energy Reduction Maintenance Switch:
    1. Installation of ERMS maintenance lockable selector switch and blue indicating light onto compartment door of the circuit breaker. Installation of the IO module and the IFE module in accordance with manufactures recommendations.
        a. Set point for the ERMS instantaneous is based on manufactures recommendations. For Square D Power Pact circuit breaker (Basis of design) the default programmed setting to the instantaneous (li) set point is 2xIn.

N. Install a permanent label indicating the panelboard or transformer where the power supply to the panel originates.
O. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
P. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
Q. Set field-adjustable circuit breaker tripping function settings as indicated.
R. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
S. Provide filler plates to cover unused spaces in panelboards.

T. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.
   5. Video surveillance system circuits.

U. Identify panelboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Division 01 - General Requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 800 amperes. Tests listed as optional are not required.
   1. Perform insulation-resistance tests on all control wiring with respect to ground.
   2. Test functions of the trip unit by means of secondary injection.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

F. Test GFCI circuit breakers to verify proper operation.
G. Test AFCI circuit breakers to verify proper operation.
H. Test shunt trips to verify proper operation.
I. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
J. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. See Division 01 – General Requirements.
B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
C. Adjust alignment of panelboard fronts.

D. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. See Division 01 – General Requirements.
B. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
C. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 PROTECTION

A. Protect installed panelboards from subsequent construction operations.

END OF SECTION – 26 24 16

26 27 16 ELECTRICAL CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes hinged cover enclosures, cabinets, terminal blocks, and accessories.
B. Related Sections:
  1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
  3. Section 27 05 33 - Conduits and Backboxes for Communications Systems.
  4. Section 28 05 33 - Conduits and Backboxes for Electronic Safety and Security.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

  1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  2. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit manufacturer's standard data for enclosures, cabinets, and terminal blocks.
C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

1.5 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
B. Furnish two of each key.

PART 2 PRODUCTS

2.1 HINGED COVER ENCLOSURES

A. Manufacturers:

1. Hoffman
2. Carlon Electrical Products.
3. Hubbell Wiring Devices.
4. Substitutions: Section 01 60 00 - Product Requirements

B. Construction: NEMA 250, Type 3R steel stainless steel enclosure.
C. Covers: Continuous hinge, held closed by flush latch operable by key.
D. Furnish interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
E. Enclosure Finish: Manufacturer's standard enamel.

2.2 CABINETS

A. Manufacturers:

1. Hoffman
2. Carlon Electrical Products.
3. Hubbell Wiring Devices.
4. Substitutions: Section 01 60 00 - Product Requirements

B. Boxes: Galvanized steel.
C. Box Size: 84 inches wide x 90 inches high x 18 inches deep.
D. Backboard: Furnish 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.
E. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
F. Furnish metal barriers to form separate compartments wiring of different systems and voltages.
G. Furnish accessory feet for free-standing equipment.

2.3 TERMINAL BLOCKS

A. Manufacturers:
1. Carlon Electrical Products
2. Hubbell Wiring Devices
3. Reliance Electric
4. Substitutions: Section 01 60 00 - Product Requirements

B. Terminal Blocks: NEMA ICS 4.

C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.

E. Furnish ground bus terminal block, with each connector bonded to enclosure.

2.4 PLASTIC RACEWAY

A. Manufacturers:

1. Panduit.
2. Hubbell Wiring Devices.
3. Carlon Electrical Products.
4. Substitutions: Section 01 60 00 - Product Requirements

B. Product Description: Plastic channel with hinged or snap-on cover.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner in accordance with Section 26 05 29.

B. Install cabinet fronts plumb.

3.2 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean electrical parts to remove conductive and harmful materials.

C. Remove dirt and debris from enclosure.

D. Clean finishes and touch up damage.

END OF SECTION – 26 27 16

26 27 26 WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.
B. Receptacles.
C. Wall plates.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements
B. Division 09 - Finishes
C. Section 260400 – General Conditions for Electrical Trades
D. Section 260519 - Electrical Power Conductors and Cables.
E. Section 260526 - Grounding and Bonding for Electrical Systems.
F. Section 260533 – Raceways and Boxes for Electrical Systems.
G. Section 260553 - Identification for Electrical Systems.
H. Section 260923 - Lighting Control Devices.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Revision H.
B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Revision G.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction.
D. NECA 130 - Standard for Installing and Maintaining Wiring Devices.
E. NEMA WD 1 - General Color Requirements for Wiring Devices.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
K. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
L. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
N. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
    2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Division 01 - General Requirements.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
   1. Wall Dimmers: Include derating information for ganged multiple devices.
   2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

C. Samples: One for each type and color of device and wall plate specified.

D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.
   2. GFCI Receptacles: Include information on status indicators.
   3. Surge Protection Receptacles: Include information on status indicators.

G. Project Record Documents: Record actual installed locations of wiring devices.
H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Division 01 - General Requirements, for additional provisions.
   2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
   3. Extra Keys for Locking Switches: Two of each type.
   4. Extra Surge Protection Receptacles: Two of each type.
   5. Extra Wall Plates: One of each style, size, and finish.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Products: Listed, classified, and labeled as suitable for the purpose intended.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
D. Provide tamper resistant receptacles for receptacles where indicated on the drawings.

E. Provide GFCI protection for receptacles installed within 6 feet of water source.
F. Provide GFCI protection in other than dwelling units for all single-phase receptacles rated 150 volts to ground or less and all three-phase receptacles rated 150 volts to ground or less, 100 amperes of less in: Bathrooms, Kitchens and on Rooftops
G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.2 WALL SWITCHES: See Section 260923 – Lighting Control Devices for specifications.
2.3 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated
   2. Leviton Manufacturing Company, Inc.
   3. Pass & Seymour, a brand of Legrand North America, Inc.
   4. Substitutions: See Division 01 - General Requirements.
   5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.
   3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.
   4. Body color:
      a. General Purpose Receptacles: color by Architect.
      b. Emergency, [Critical Branch], [Equipment Branch] receptacles: Red.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
   3. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
   4. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   5. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

6. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
7. Illuminated Convenience Receptacles: Hospital grade, 20A, 125V, NEMA 5-20R; illuminated face or indicator light to indicate power is being supplied to receptacle; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.4 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated
   2. Leviton Manufacturing Company, Inc.
   3. Pass & Seymour, a brand of Legrand North America, Inc.
   4. Substitutions: See Division 01 - General Requirements.
   5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Screws: Metal with slotted heads finished to match wall plate finish.
   3. Provide screwless wallplates with concealed mounting hardware where indicated.

C. As selected by Architect

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:
    a. Wall Switches: 48 inches above finished floor.
    b. Wall Dimmers: 48 inches above finished floor.
    c. Fan Speed Controllers: 48 inches above finished floor.
    d. Receptacles: 18 inches above finished floor or 6 inches above counter.

        1) Install convenience GFCI type receptacles 36 to 48 inches above roof deck. Or at designated heights as indicated on drawings.
    2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
    3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
    4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
    5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in special application enclosures per manufacturer’s instructions, provide stainless steel cover plates.
D. Install wiring devices in accordance with manufacturer's instructions.
E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
F. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper. When stranded conductors are used in lieu of solid, use insulated crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screw terminals.
I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
J. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
K. Install wiring devices plumb and level with mounting yoke held rigidly in place.
L. Install wall switches with OFF position down.
M. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
N. Do not share neutral conductor on branch circuits utilizing wall dimmers.
O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
R. Identify wiring devices in accordance with Section 260553.

3.4 FIELD QUALITY CONTROL

A. See Division 01 - General Requirements.
B. Inspect each wiring device for damage and defects.
C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
D. Test each receptacle to verify operation and proper polarity.
E. Test each GFCI protected receptacle for proper tripping operation according to manufacturer's instructions.
F. Inspect each surge protection receptacle to verify surge protection is active.
G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.
B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION – 26 27 26

26 41 13 LIGHTNING PROTECTION FOR STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Strike (air) terminals and interconnecting conductors.
B. Grounding and bonding for lightning protection.
C. Description: Conductor system protecting entire structure and having UL Master Label.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements
B. Section 260400 – General Conditions for Electrical Trades
C. Section 260526 - Grounding and Bonding for Electrical Systems: Electrical system grounds.
D. Surge Protection for Wiring Systems: Specified in individual system requirements.

1.3 REFERENCE STANDARDS

A. NFPA 780 - Standard for the Installation of Lightning Protection Systems;
B. UL 96 - Lightning Protection Components; Current Edition, Including All Revisions.
C. UL 96A - Installation Requirements for Lightning Protection Systems.
D. Perform Work in accordance with UL 96A and furnish Master Label.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination with Concrete Work: Coordinate the embedding of lightning protection components in concrete.
B. Coordination with Roofing Installation:
  1. Ensure adequate attachment of strike terminals and conductors without damage to roofing.
  2. Sealing and flashing of all lightning protection roof penetrations with roofing contractor.

C. Coordinate with all trades to ensure a correct, neat and unobtrusive installation.
D. Pre-installation Meeting: Convene a meeting at least two weeks prior to commencement of any work affected by lightning protection system requirements to discuss prerequisites and coordination required by other installers; require attendance by representatives of installers whose work will be affected.

1.5 SUBMITTALS

- A. See Division 01 – General Requirements.
- B. Shop Drawings: Indicate location and layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.
  - 1. Where conductors or grounds are to be embedded or concealed in other construction, submit shop drawings at least 30 days prior to start of construction.
  - 2. If concrete-encased grounds are to be used and are not shown in the contract documents, provide sufficient data to determine concrete encasement dimensions and location.
  - 3. Include data on actual ground resistance determined by field measurement in accordance with NFPA 780.
  - 4. Include engineering analysis of equalization of potential to metal bodies within the structure.
  - 5. Include access panels, test holes, and disconnecting means for maintenance.

- C. Product Data: Provide dimensions and materials of each component, indication of testing agency listing, and installation instructions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Installation Certification: Submit copy of certification agency's approval UL Master Label.
- F. Operation and Maintenance Data: Provide recommended inspection and testing plan, including recommended intervals, to achieve periodic maintenance as recommended in NFPA 780; provide customized plan reflecting actual installation configuration with specific installed components identified.
- G. Project Record Documents: Record actual locations of air terminals, grounding electrodes, bonding connections, and routing of system conductors in project record documents.

1.6 QUALITY ASSURANCE

- A. Maintain one copy of each referenced system design standard on site.
- B. Manufacturer Qualifications: Company specializing in lightning protection equipment with minimum three years documented experience.
- C. Designer Qualifications: Person or entity, employed by installer, who specializes in lightning protection system design with minimum three years documented experience.
- D. Installer Qualifications: Capable of providing the specified certification of the installed system.
- E. Installer Qualifications: Company specializing in lightning protection system design with minimum three years documented experience.

F. Field Quality Control Testing Agency Qualifications: Firm capable of and experienced in grounding and bonding testing with documented experience and minimum of three project references.

G. Products: Listed, classified, and labeled as suitable for the purpose intended.

H. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

I. Design lightning protection system under direct supervision of NFPA 780 Certified Designer or experienced in design of this Work and licensed in State where work is performed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Lightning Protection Components:
  1. Advanced Lightning Technology (ALT)
  2. Harger Lightning and Grounding
  3. thermOweldae, subsidiary of Continental Industries; division of Burndy LLC;
  4. Substitutions: See Division 01- General Requirements.

2.2 LIGHTNING PROTECTION SYSTEM

A. Lightning Protection System: Provide complete system complying with NFPA 780, including air terminals, bonding, interconnecting conductors and grounding electrodes.
  1. Provide system that protects:
     a. The entire structure.
     b. Open air areas within 100 feet of exterior walls at grade level.
     c. Open air areas within building footprint.
     d. Metal fences identified on site plan.
     e. Aboveground metal water tank (grounding only).
     f. Aboveground concrete water tank.
     g. Metal communications towers (grounding only).
  2. Coordinate with other grounding and bonding systems specified.
  3. Treat isolated non-grounded protruding metal items as specified by NFPA 780 for heavy-duty stacks.
  4. Determine ground resistance by field measurement.
  5. Provide copper and bronze components, as specified in following sections.
  6. Provide disconnecting means and access panels or similar devices to allow complete periodic inspection and testing as described by NFPA 780 Annex D. check GR
  7. Provide materials that are galvanically compatible with the structure and system components.
  8. Provide system certified by Underwriters Laboratories or the Lightning Protection Institute.
  9. Conceal all downleads within structure.

B. Strike Terminals: Provide strike (air) terminals where indicated on the drawings, or as required by delegated design
C. Strike Terminals: Provide strike (air) terminals on the following:
   1. Roofs.
   2. Water storage tanks.
   3. Trees.

2.3 COMPONENTS

A. All Components: Complying with applicable requirements of UL 96.
B. Strike (Air) Terminals: Copper, solid, with adhesive bases for single-ply roof installations.
C. Grounding Rods: Solid copper.
D. Ground Plate: Copper.
E. Conductors: Copper cable.
F. Connectors and Splicers: Bronze.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.
B. Coordinate work with installation of roofing and exterior and interior finishes.

3.2 INSTALLATION

A. Install in accordance with referenced system standards and as required for specified certification.
B. Connect conductors using mechanical connectors or exothermic welding process; protect adjacent construction elements and finishes from damage.
C. Connect conductors using mechanical connectors.
D. Connect conductors using exothermic welding process; protect adjacent construction elements and finishes from damage.
E. Downleads from roof to grade shall be routed within building envelope. Exposed downleads are not acceptable.
   1. Route downleads concealed within wall cavities.
   2. Coordinate roof penetrations with roofing installation to ensure a watertight seal.

3.3 FIELD QUALITY CONTROL

A. See Division 01, for additional requirements.
B. Perform visual inspection as specified in NFPA 780 as if this were a periodic follow-up inspection.
C. Perform continuity testing as specified in NFPA 780 as if this were testing for periodic maintenance.
D. Obtain the services of the specified certification agency to provide inspection and certification of the lightning protection system, including performance of any other testing required by that agency.
E. Perform inspection and testing in accordance with UL 96A.

END OF SECTION – 26 41 13

26 51 00 LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.
B. Exterior luminaires.
C. LED drivers.
D. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 0533 – Raceways and Boxes for Electrical Systems.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
E. Lighting Fixture Schedule as indicated on drawings.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.
B. IESNA LM-63-19: ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information.
C. IES LM-79-19: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.
D. IES LM-80-21: Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2015.
I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
J. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
K. UL 1598 - Luminaires; Current Edition, Including All Revisions.
L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports,

anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility, installed by other sections or others.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.

B. Shop Drawings:
  1. Indicate dimensions and components for each luminaire of the manufacturer.
  2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Shop Drawings: For nonstandard or custom luminaires.
  1. Include plans, elevations, sections, and mounting and attachment details.
  2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include diagrams for power, signal, and control wiring.

D. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  1. Arrange in order of luminaire designation.
  2. Include data on features, accessories, and finishes.
  3. Include physical description and dimensions of luminaires.
  4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA LM-79 and IESNA LM-80.
    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: Photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    c. TM-21 report for L70 rating at color temperature specified.
6. LED drivers: Include wiring diagrams and list of compatible LED configurations.
7. LED arrays: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

E. Samples:
    1. Provide one sample(s) of each specified luminaire upon request.
    2. Provide one sample(s) of each custom luminaire.
    3. Provide one sample(s) of each luminaire proposed for substitution upon request.
    4. Provide one sample(s) of each product finish illustrating color and texture upon request.
    5. Provide a mockup of selected luminaires upon request.
    6. Submit two color chips 3 x 3 inch in size illustrating luminaire finish color where indicated in luminaire schedule.

F. Certificates for Dimming Drivers: Manufacturer's documentation of compatibility with dimming controls to be installed.
G. Field quality control reports.
H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.6 EXTRA PRODUCTS

A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Division 01 – General Requirements.
    2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
    3. LED Drivers: Furnish two of each driver type

B. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 QUALIFICATION DATA: For testing laboratory providing photometric data for luminaires.

A. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

B. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
C. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

1.9 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.10 FIELD CONDITIONS

A. Maintain field conditions within the manufacturers required service conditions during and after installation.

1.11 WARRANTY

A. See Division 01 – General Requirements.
B. Section 26 0400 – General Requirements for Electrical Trades.

C. Unless otherwise noted in Lighting Fixture Schedule, Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in Lighting Fixture Schedule included on the drawings.
B. Substitutions: See Division 01- General Requirements, except where individual luminaire types are designated with substitutions not permitted and the following:
  1. Section 26 04 00 – Product Requirements and as follows:
    a. Approved equals to the basis of design fixture as listed in the Lighting Fixture Schedule shall be accepted for review with the proposed substitute fixture meeting the following minimum requirements:
      1) Be of the same general size, style and shape, including but not limited to lens construction and shading.
      2) Be of equal or better quality and construction.
      3) Be supplied with all required accessories to match the specified fixture.
      4) Be supplied with all remote drivers, power supplies and cabling lengths to meet specified performance and control.
      5) Provide the same or better distribution, efficiency, source lumen output, and L70 lumen depreciation metric.
    b. Provide point by point photometric calculations at the request of the Engineer for evaluation.
    c. The basis of design fixture listed in the Lighting Fixture Schedule lists part numbers, specifications, options, accessories and source output available at the time of design. Substitutions shall meet these requirements as scheduled.
    d. The evaluation of an approved equal shall be at the sole discretion of the Architect and Engineer.

2.2 INTERIOR LUMINAIRES

A. Manufacturers:
  1. Manufacturers represented by Apex Lighting.
  2. Manufacturers represented by Lighting Affiliates.
  3. Manufacturers represented by Illuminate.
  4. Manufacturers represented by Reflex Lighting.
  5. Substitutions: See paragraph 2.1, B.

B. Provide products that comply with requirements of NFPA 70.
C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s)/LED arrays and all sockets, drivers, reflectors, lenses, housings and other components required to position, energize and protect the lamp/LED array and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.

J. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

K. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

L. Luminaires in Special Environments:
   1. Wet Locations: Provide with sealed and gasketed lens.

2.3 EXTERIOR LUMINAIRES

A. Manufacturers:
   1. Manufacturers represented by Apex Lighting.
   2. Manufacturers represented by Lighting Affiliates.
   3. Manufacturers represented by Illuminate.
   4. Manufacturers represented by Reflex Lighting.
   5. Substitutions: See paragraph 2.1, B.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s)/LED arrays and all sockets, drivers, reflectors, lenses, housings, poles, brackets, bases, vibration dampers, isolation pads and other components required to position, energize and protect the lamp/LED array and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Provide IESNA full cut-off classified products unless otherwise indicated or provide products with backlight, uplight and glare (BUG) ratings as indicated.

J. Provide products with IESNA light distribution as indicated.

K. Provide products with internal/external house-side shields as indicated.

L. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data or as indicated.

M. Poles:
   1. Material and Finish: Refer to Lighting Fixture Schedule.
   2. Section Shape and Dimensions: Round.
   3. Height: As indicated on Drawings or as scheduled.
   4. Base: Breakaway.
   5. Accessories:
      a. Handhole.
      b. Anchor bolts.
      c. Base Cover.
      d. Decorative base.
      e. Pre-drilled for luminaire mounting.
      f. Banner arms.
      g. Integral GFI receptacle.
   6. Loading Capacity Ratings:
      a. Provide with EPA rating suitable for maximum wind load in area, including EPA for attached luminaires and all required accessories.
      b. Consult with local authorities for wind loading requirements.

2.4 MATERIALS

A. Parts:
   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging.
   4. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other

components from falling accidentally during relamping and when secured in operating position.

5. Diffusers and Globes:
   a. Refer to Interior Lighting Fixture Schedule for types.
   b. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   c. Glass: Annealed crystal glass unless otherwise indicated.
   d. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
6. Housings:
   a. Extruded-aluminum housing and heat sink unless otherwise indicated.
   b. Powder-coat finish unless otherwise indicated, color selection by Architect.
7. Factory-Applied Labels: Comply with UL 1598. Include recommended LED array. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when LED arrays are in place.
   a. Label shall include the following LED source characteristics:
      1) "USE ONLY" and include specific LED type.
      2) LED shape, size, wattage, and coating.
      3) CCT and CRI for all luminaires.

B. METAL FINISHES
   1. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LED DRIVERS

A. Manufacturers:
   1. eldoLED.
   2. Lutron Electronics Company.
   3. Osram Sylvania.
   4. Philips Lighting Electronics/Advance.
   5. Substitutions: See Division 01- General Requirements, Product Requirements.
   6. Manufacturer Limitations: Where possible, for each type of luminaire provide driver produced by a single manufacturer.
   7. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
   8. Provide LED drivers compatible with the approved lighting control systems.

B. LED Drivers - General Requirements:
   1. Minimum Efficiency: Provide LED drivers complying with all current applicable federal and state efficiency standards.
   2. Electronic LED Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
      a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      b. Total Harmonic Distortion: Not greater than 20 percent.

        c. Power Factor: Not less than 0.95.

C. LED Drivers:
  1. Product Description: LED dimming driver.
      a. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
      b. Digital (DALI Low Voltage Controlled) Dimming Drivers
      c. Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers
  2. General:
      a. LED dimming shall be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
      b. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
      c. Driver must limit inrush current.
          1) Base specification: Meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 Amps (^2) – seconds.
          2) Preferred Specification: Meet or exceed 30mA(^2)s at 277VAC for up to 50 watts of load and 75A at 240us at 277VAC for 100 watts of load.
      d. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
      e. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
      f. Total Harmonic Distortion less than 20% percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.
      g. Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
          1) Adjustment of forward LED voltage, supporting 3V through 55V.
          2) Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA
          3) Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
      h. Driver must be able to operate for a (+/- 10%) supply voltage of 120V through 277VAC at 60Hz.
      i. Driver should be UL Recognized under the component program and shall be modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
      j. Driver shall include ability to provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls

for light to be extinguished and shall consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V shall be included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.

3. Light Quality
    a. Over the entire range of available drive currents, driver shall provide step-free, continuous dimming to black from 100 percent to 1 percent and 10% relative light output where indicated, or 100 – 10% light standard. Driver shall respond similarly when raising from 1% to 100%
    b. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
    c. Drivers to track evenly across multiple fixtures at all light levels, and shall have an input signal to output light level that allows smooth adjustment over the entire dimming range.
    d. Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100-1 percent luminaire shall have:
        1) LED dimming driver shall provide continuous step-free, flicker free dimming similar to incandescent source.
        2) Base specification: Flicker index shall less that 5% at all frequencies below
        3) 1000 Hz.
        4) Preferred specification: Flicker index shall be equal to incandescent, less that 1% at all frequencies below 1000 Hz.
4. Control Input
    a. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
        1) Must meet IEC 60929 Annex E for General White Lighting LED drivers
        2) Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
        3) Must meet ESTA E1.3 for RGBW LED drivers
5. Driver: Approved by dimming system manufacturer as suitable for operation with control unit and suitable for LED source type and quantity specified for luminaire.

2.6 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 “Hangers and Supports for Electrical Systems” for channel and angle iron supports and nonmetallic channel and angle supports.
B. Single-Stem Hangers: 1/2-inch steel tubing with heavy duty swivel ball fittings and ceiling canopy. Finish same as luminaire.
C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage minimum.
D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.
F. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
C. Verify that suitable support frames are installed where required.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533 as required for installation of luminaires, emergency lighting units and exit signs provided under this section.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install products in accordance with manufacturer's instructions.
D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
F. Suspended Ceiling Mounted Luminaires:
    1. Do not use ceiling tiles to bear weight of luminaires.
    2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
    3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
    4. Secure pendant-mounted luminaires to building structure.

        a. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
    5. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box, heavy-duty swivel hangers and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
    6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
    7. See Division 09 - Finishes where suspended grid ceiling is specified for additional requirements.

G. Suspended Luminaires:
    1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
    2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
    3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
    4. Install canopies tight to mounting surface.
    5. Secure pendant-mounted luminaires to building structure.
        a. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
    6. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box, heavy-duty swivel hangers and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
    7. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
    8. Unless otherwise indicated, support pendants from swivel hangers.

H. Exterior Luminaires:
    1. Install concrete bases for lighting poles at locations as indicated on Drawings, in accordance with Division 03 - Concrete.
    2. Verify foundations are ready to receive luminaires.
    3. Install poles plumb. Install shims to adjust plumb. Grout around each base.
    4. Set pole with integral handhole 180 degrees opposite of drive lane, parking lot or curb line.
    5. Install vibration dampers and isolation pads as indicated.
    6. Install LED array in each luminaire.
    7. Bond and ground luminaries metal accessories in accordance with Section 26 05 26.
    8. Aim and adjust luminaires with distribution aimed towards coverage area and parallel to curb line or to provide illumination levels and distribution as indicated.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.
K. Bond products and metal accessories to branch circuit equipment grounding conductor.
L. Remote LED drivers: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.
M. Replace LED arrays that fail prematurely.
N. Install accessories furnished with each luminaire.
O. Connect luminaires to branch circuit using flexible conduit, except for emergency lighting which shall be in conduit completely.
P. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
Q. Ground and bond interior luminaires in accordance with Section 26 05 26.

3.4 FIELD QUALITY CONTROL

A. See Division 01 – General Requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Test self-powered exit signs, emergency lighting units, and emergency power supply units to verify proper operation upon loss of normal power supply.
E. Correct wiring deficiencies and repair or replace damaged or defective products.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
B. Aim and position adjustable emergency lighting unit LED arrays to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
B. Clean photometric surfaces as recommended by the manufacturer.

3.7 CLOSEOUT ACTIVITIES

A. See Division 01- General Requirements

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

C. Just prior to Substantial Completion, replace all LED arrays that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION – 26 51 00

27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for communications equipment, conduit, cable, boxes, and other communications work.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements
B. Division 03 - Cast-in-Place Concrete: Concrete equipment pads.
C. Section 260400 – General Conditions for Electrical Trades
D. Section 260529 – Hangers and Supports for Electrical Systems
E. Section 271000 – Structured Cabling

1.3 REFERENCE STANDARDS

A. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
B. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. See Division 01: General Requirements.
B. Coordination:
    1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components being installed.

2. Coordinate the work with other trades and provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

C. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
D. Installer's Qualifications: Include evidence of compliance with specified requirements.
E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.
B. Comply with latest adopted version of applicable building code, including any addendum or supplements.
C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
D. Installer Qualifications for Field-Welding: As specified in Section 260400 General Requirements for Electrical Trades.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 Refer to Section 260529 – Hangers and Supports for Electrical Systems. All Part 2 Product requirements listed in this Section shall also apply to Division 27 Communications, except where specified otherwise herein.

PART 3 EXECUTION

3.1 Refer to Section 260529 – Hangers and Supports for Electrical Systems. All Part 3 Execution requirements listed in this Section shall also apply to Division 27 Communications, except where specified separately herein.

3.2 INSTALLATION – COMMUNICATIONS SYSTEM SUPPORT COMPONENTS

A. Backboxes for communications devices shall be permitted to be supported from a grid ceiling. A tile bridge shall be furnished for this purpose. Refer to Section 26 05 33.

B. Overhead speakers, plenum boxes, audiovisual equipment, and other devices weighing more than a standard electrical backbox shall be supported via a threaded rod fastened to the building structure.

END OF SECTION – 27 05 29

27 05 33 RACEWAY AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Raceway and Boxes for Communications Systems.

B. Related Sections:
  1. Section 260400 – General Conditions for Electrical Trades.
  2. Section 260526 - Grounding and Bonding for Electrical Systems.
  3. Section 260533 - Raceway and Boxes for Electrical Systems.
  4. Section 260534 - Floor Boxes for Electrical Systems.
  5. Section 270529 - Hangers and Supports for Communications Systems.
  6. Section 270553 - Identification for Communications Systems.

1.2 REFERENCES

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC);
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S);
C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A);
D. NECA 1 - Standard for Good Workmanship in Electrical Construction;
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT);
F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit;
G. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC);
H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable;
I. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit;
J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit;
K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing;
L. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT);
M. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

N. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
O. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
Q. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
S. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
T. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
U. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
V. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
W. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
X. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
Y. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
Z. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
AA. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
BB. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
CC. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.3 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
    2. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

3. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
  1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for all conduits and fittings outlined in Part 2.
C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
D. Shop Drawings:
  1. Indicate proposed arrangement for conduits to be installed within or under structural concrete slabs, where permitted.
  2. Include proposed locations of roof penetrations and proposed methods for sealing.

E. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs (where permitted), and conduits 2 inch trade size and larger.
F. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
G. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Division 01 – General Requirements.
  2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General Requirements
B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
C. Protect PVC conduit from sunlight.
D. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

1.8 COORDINATION

A. See Division 01 – General Requirements
B. Coordinate installation of outlet boxes for equipment connected under Section 260503.
C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.
D. Communications contractor is responsible to fully coordinate with the site and concrete contractors and all other trades when routing conduit underslab. Routing of conduit underslab may be acceptable, provided spacing of conduits is adequate for proper backfilling of area surrounding conduits. Adequate spacing shall mean using factory made conduit spacers that allow for a minimum of 3-inches for backfilling with sand or 3 times the pipe diameter for backfilling with a structural fill. Proposed conduit routing, installation and methods and backfilling procedures shall be submitted to the Engineer for review prior to installation.

PART 2 PRODUCTS

2.1 Refer to Section 260533 – Raceway and Boxes for Electrical Systems. All Part 2 Product requirements listed in this Section shall apply to Division 27 Communications.

PART 3 EXECUTION

3.1 Refer to Section 260533 – Raceway and Boxes for Electrical Systems. All Part 3 Execution requirements listed in this Section shall apply to Division 27 Communications.

END OF SECTION – 27 05 33

27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Communication system identification requirements.
B. Identification nameplates and labels.
C. Wire and cable markers.

1.2 RELATED REQUIREMENTS (follow the most currently adopted amended version)

A. See Division 01 – General Requirements
B. Division 09 - Finishes.
C. Section 260400 – General Conditions for Electrical Trades.
D. Section 260553 – Identification for Electrical Trades.

1.3 REFERENCE STANDARDS (follow the most currently adopted amended version)

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.
B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.
C. NFPA 70 - National Electrical Code.
~~D.~~ NFPA 70E - Standard for Electrical Safety in the Workplace
E. UL 969 - Marking and Labeling Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
    1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
    2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Division 01- General Requirements

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General Requirements
B. Accept identification products on site in original containers. Inspect for damage.
C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.8 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature and humidity is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 Refer to Section 260553 – Identification for Electrical Systems. All Part 2 Product requirements listed in this Section shall also apply to Division 27 Communications.

PART 3 EXECUTION

3.1 Refer to Section 260553 – Identification for Electrical Systems. All Part 3 Execution requirements listed in this Section shall also apply to Division 27 Communications, except where specified separately herein.

3.2 INSTALLATION – COMMUNICATIONS SYSTEM LABELING

A. Label Installation:
    1. All labeling standards shall be confirmed with and approved by owner’s IT staff prior to performing work. It is the responsibility of the contractor to coordinate with owner’s staff.

2. Labeling procedures shall meet TIA/EIA 568B Series standard and BICSI Standards and shall be pre-approved by the Owner.
3. Permanently label, using pre-printed labels, all cables and terminations.
    a. Patch panels and cross-connect blocks, numerically from top to bottom.
    b. Patch panel port with work area outlet label.
    c. Cable segments.
4. Install label parallel to equipment lines.
5. Use industry standard TIA/EIA and BISCI color codes.
6. Each work station outlet jack and corresponding patch panel port shall be marked with the same, unique label.
7. Mark the plate with standard nomenclature as required by the configuration. Mark the outlet plainly and neatly with its station identification, as indicated in above paragraph. The station identification shall also be marked inside the outlet plate on the backing plate of the outlet, and shall match the ID used at the patch panel port. Make the outlet marking using the Panduit system or equal, except for the inside marking which may be by indelible marker. Place exposed marking on outlet plates under a transparent window for protection. Label cable with permanent marker compliant with EIA/TIA 606, six (6) inches back from the termination at both ends.

B. Wire Label Installation:
1. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
2. Install labels at data outlets identifying patch panel and port designation as specified.

C. Conduit Marker Installation:
1. Install conduit marker for each conduit longer than 10 feet.
2. Conduit Marker Spacing: 20 feet on center.

END OF SECTION – 27 05 53

27 10 00 STRUCTURED CABLING

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections with DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Attention is directed Section 26 0400 – GENERAL CONDITIONS FOR ELECTRICAL TRADES, which is hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section includes communications horizontal cabling.

B. Related Sections:
  1. Division 01 – General Requirements
  2. Section 26 0400 – General Conditions for Electrical Trades
  3. Section 26 0526 – Grounding and Bonding
  4. Section 27 0529 – Hangers and Supports for Communications Systems
  5. Section 27 0533 – Conduit and Backboxes for Communications Systems
  6. Section 27 0553 – Identification for Communications Systems

1.3 REFERENCES

A. All wire and components supplied and installed shall meet the requirements of the following and all sub-referenced documents:
  1. The National Electrical Code, Article 800.
  2. International Electrical Testing Association:
     a. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
  3. National Fire Protection Association:
     a. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
  4. Underwriters Laboratories, Inc.:
     a. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces.

B. All components supplied and installed shall meet the requirements of the following standards set forth by the Telecommunications Industry Association/ Electronic Industries Alliance:
  1. TIA/EIA-569-C – Telecommunications Pathways and Spaces.
  2. TIA/EIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises.
  3. TIA/EIA-568-C.1 – Commercial Buildings Telecommunication Cabling Standard.

4. TIA/EIA-568-C.2 – Balanced Twisted Pair Telecommunications Cabling and Components Standard.
5. TIA/EIA 568-C.3 – Optical Fiber Cabling Components.
6. TIA/EIA-607-B – Generic Telecommunications Bonding and Grounding for Customer Premises.

1.4 SYSTEM DESCRIPTION

A. Horizontal pathway: Conform to TIA/EIA 569 using conduit, sleeves, J-Hooks, and other methods indicated on drawings.
B. Horizontal cabling: Cable connections in structured cabling between equipment rooms/ telecommunications closets to the work area outlet. Horizontal cabling consists of the transmission media, main and intermediate cross-connects and terminations at these locations.
C. Structured Cabling system shall include equipment room fittings, racks, cabinets, and accessories.
D. System shall be completely tested, certified and warrantied as specified herein.
E. System shall include record drawings and documentation.
F. System shall include operation and maintenance instruction manuals.

1.5 SUBMITTALS

A. Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for all products specified herein. Include detailed information on equipment construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, performance, installed accessories, and compatibility; include model number nomenclature clearly marked with all proposed features.
C. Test Reports: Indicate procedures and results for specified field testing and inspection.
D. Cabling Diagram: Submit for approval a complete single line cabling diagram for the building. This diagram shall include types and quantities of backbone and horizontal cabling to be installed throughout the building. Quantities to each individual work area outlet are not required to be shown in this cabling diagram; typical cable types are acceptable for this purpose. Include types of connectors at both ends of cabling. Include part numbers within this diagram.
E. Submit for review installer qualifications as specified herein.
F. Submit for approval a typical work area outlet panel diagram with labeling, AFTER coordination with Owner to verify labeling standard. All labels shall be coordinated with the Owner as specified herein, and in Section 27 0553.

1.6 CLOSEOUT SUBMITTALS

A. Division 01- General Requirements.
B. Project Record Documents: Record actual locations and sizes of pathways and outlets.
C. Submit as-built drawings for review.
D. Submit operations and maintenance data for review.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum THREE YEARS documented experience.
B. UL Compliance: The communication system supplied shall be listed by Underwiters' Laboratories under the UL Standard 1459 for Telephone Appliances and Equipment. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.
C. FCC Approval: The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems that are not FCC approved or that utilize intermediary devices for connection, shall not be considered. Provide FCC registration number of the system being proposed as part of the submittal process.
D. Installer: Company specializing in installing products specified in this section with minimum three years documented experience, and with service facilities within 50 miles of project.
    1. Evidence of ability: Furnish training certifications. Certified training shall be industry recognized at least equal to:
        a. Building Industry Consulting Service international, Inc (BICSI).
        b. Ortronics Certified installer.
        c. Hubbell Certified installer.
        d. Leviton Certified Installer.
        e. Siemon Cabling System Certified Installer.

E. Provide a full time, on-site Project manager to supervise the project.
F. Testing Agency: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.

1.8 PRE-INSTALLATION MEETINGS

A. Division 01– General Requirements.
B. Convene minimum THREE WEEKS prior to commencing work of this section.

1.9 EXTRA MATERIALS

A. Division 01 – General Requirements.
B. Furnish five of each length and type of patch cords.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 COORDINATION

A. Coordinate the installation of cable and equipment with other construction activities and the work of other sections.
B. Pre-installation Conference: Conduct conference at project site to comply with requirements in Division 01.

1.12 WARRANTY

A. Provide a warranty for minimum one (1) year against defects in material and workmanship on all components, equipment, software, systems, cabling, etc. as specified herein.
B. Data Cabling Warranty: provide a manufacturer’s data cabling twenty-five (25) year system performance warranty for the voice and data structured cabling system.
    1. The Contractor shall provide documented proof that he/she is authorized and certified and in good standing with the manufactures to provide this warranty.
    2. The contractor shall provide a written 25-year warranty from the manufacturer at substantial completion of the project.
    3. The warranty shall include connecting hardware products and installed cable as part of the data cabling system warranty.
    4. The data cabling system shall include:
        a. Horizontal cable.
    5. The manufacturer’s warranty shall guarantee that the data cabling system shall be free from defects in materials and workmanship for the duration of the warranty.

PART 2 PRODUCTS

2.1 HORIZONTAL CABLE (CATEGORY 6)

A. Manufacturers:
    1. Hitachi Cable America, Inc. – Premium Enhanced UTP Cat.6
    2. Siemon
    3. Hubbell
    4. Mohawk/Belden
    5. Substitutions: Division 01 – General Requirements.

B. All cabling shall meet or exceed Commercial Building Telecommunications Cabling Standard ANSI/TIA/EIA 568-C.2, adhering to Category 6 specifications.
C. All horizontal cabling shall be communications plenum cable type (CMP).
D. Cabling shall use 23AWG minimum conductors.
E. Pulling tension: The cable pulling tension shall not exceed 25 ft/lbs as indicated in TIA/EIA-568-A.
F. Coordinate color of horizontal cabling with the Owner.
G. Category 6 cabling shall have the following worst-case headroom losses:
    1. NEXT Loss: +5 dB (Guaranteed Worst Case Headroom)
    2. PSNEXT Loss: +5 dB (Guaranteed Worst Case Headroom)
    3. ACRF: +6 dB (Guaranteed Worst Case Headroom)
    4. PSACRF: +6 dB (Guaranteed Worst Case Headroom)

H. Category 6 cabling shall support 1 gigabit Ethernet.
I. Category 6 cabling shall support the following Power-over-Ethernet protocols:
    1. 15W PoE (IEEE 802.3af)
    2. 30W PoE+ (IEEE 802.3at)
    3. 60W PoE++ (IEEE 802.3bt Type 3)

J. Cable outside diameter: 0.20 inch.
K. UTP Patch Cords: Supply patch cords which meet the following specification and are of the same TIA/EIA category rating and manufacturer as the workstation cabling:
    1. EIA/TIA 568-C.2 Category 6 to match patch panel type.
    2. 24 AWG stranded conductors
    3. Quantity: (48) per each Patch Panel provided for the project, plus 10% spare capacity
    4. Length: 50% shall be 7 feet, 50% shall be 5 feet.

2.2 LIGHTNING PROTECTION FOR COMMUNICATIONS CABLING

A. Manufacturers:
    1. Circa
    2. Citel
    3. Times Protect
    4. Substitutions: See Division 1 – Product Requirements.

B. Provide surge/lightning protection for all exterior copper telecommunications cabling (both aerial and underground). This shall include, but not be limited to the following:
    1. Service entrance cabling
    2. Cabling between buildings
    3. Cabling for paging, clock and other building systems
    4. Data/Voice horizontal cabling
    5. CATV Cabling

C. Provide surge/lightning protection for all copper backbone cabling between the service entrance room to each equipment room.

D. For service entrance cabling and telecommunications backbone cabling, provide Circa model 1880ECA1-XXX or equal (sized appropriately), to interface directly with rack-mounted patch panels and distribution.

E. For horizontal data/voice cabling to exterior systems or between buildings, provide Citel model #E280 or equal, type and quantity as required by the system being protected.

F. For CATV cabling to exterior systems or between buildings, provide Citel P8AX series in-line surge arrestor or equal. Provide surge arrestor at each end of coaxial line.

G. For POE/ethernet cabling to exterior systems or between buildings, provide Citel model MJ8-POE-A or equal, type and quantity as required by the system being protected.

PART 3 EXECUTION

3.1 INSTALLATION

A. Rated Stairs: Penetrations into stairs are NOT permitted except for items serving that stair.

B. Wiring Method:

1. Install all required telecommunications conduits, sleeves, and back boxes. Conduits, sleeves and boxes shall be installed in accordance with Section 270533.
2. Install cables in raceways, conduits and interstitial spaces above suspended ceilings.
3. Conceal wiring except in unfinished spaces.
4. Wire shall not be subjected to pulling tensions greater the maximum specified by the manufacturer
5. Wire bend radius shall not be less than the manufacturer’s minimum of one (1) inch.

C. Grounding of telecommunications equipment and cabling:

1. Ground all equipment in accordance with Section 26 0526 – Grounding and Bonding.
2. Provide grounding, surge protection and lightning protection of telecommunications system in accordance with latest version of Grounding, Bonding and Electrical Protection chapter of the BICSI TDM Manual, TIA/EIA 607, and NFPA 70.
3. Conform to all telecommunications grounding and bonding details and riser diagrams included within the drawings.

3.2 TESTING, HORIZONTAL CABLING

A. Horizontal cabling testing shall be conducted from the jack at the outlet in the Work Area to the Patch Panel on which the cables are terminated.

B. Baseline accuracy of the test equipment must exceed TIA Level III, as indicated by independent laboratory testing. Test adapter cable must be approved by the manufacturer of the test equipment.

C. All horizontal cables must be tested with a Level 3 Fluke DTX Networks Cable Tester.

D. Testing of the Permanent Link shall be performed. However, contractor shall warrant performance based on channel performance and provide patch cords that meet channel performance criteria. All cabling not tested strictly in accordance with these procedures shall be retested at no cost to the Owner.

E. Horizontal station cables shall be free of shorts within the pairs, and be verified for continuity, pair validity, and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or miss-positioned pairs must be identified and corrected.

F. Testing of the Cabling Systems rated at TIA Category 6/6A and above shall be performed to confirm proper functioning and performance.

G. Testing of the Transmission Performance of station cables (Category 6/6A) shall include:
   1. Length
   2. Attenuation
   3. Pair to Pair NEXT
   4. ACR
   5. PSNEXT Loss
   6. Return Loss
   7. Pair to Pair ELFEXT Loss (Equal Level Far End Cross-Talk)
   8. PSEFEXT Loss
   9. Propagation Delay
   10. Delay Skew
   11. Return Loss

H. The maximum length of horizontal cable shall not exceed 90 meters, which allows 10 meters for equipment and patch cables.

I. Cables shall be tested to the maximum frequency defined by the EIA/TIA 568B standards covering that performance category. Test records shall verify a “PASS” on each cable and display the specified parameters – comparing test values with standards based “templates” integral to the unit.

J. Any “Pass*” or “Warning” test results shall be considered a “FAIL” for the channel or permanent link under test. In order to achieve an overall “Pass Condition”, the test result for each individual test parameter shall be “PASS”.

K. All data shall indicate the worst-case result, the frequency at which it occurs, the limit at that point, and the margin. These tests shall be performed in a swept frequency manner from 1MHz to the highest relevant frequency, using a swept frequency interval consistent with TIA and ISO requirements. Information shall be provided for all pairs or pair combinations. And in both directions when required by the appropriate standards.

3.3 DOCUMENTATION

A. At the completion of the project and prior to system acceptance provide the following documentation:

1. As-built floor plans that show the final location and identification of the telecom outlets. Submit the floor plans in printed form and as AutoCAD 2010 files (Original AutoCAD files will be made available).
2. Test results for each strand of fiber optic cable installed. This should be supplied in a page per strand printed format and in machine-readable (computer file) format. If the machine-readable file requires special software for reading, a single-user version of that software shall be provided as well.
3. Test results for each pair of copper riser cabling installed and the installed cable length.
4. Test results for each UTP station cable installed. This should be supplied in a page per cable printed format and in machine-readable (computer file) format. If the machine-readable file requires special software for reading, a single-user version of that software will be provided as well.
5. Test results for each coaxial riser and horizontal cable installed. Documentation indicating successful testing and length for each cable shall be bound and provided by the vendor.
6. Cross connection documentation for the voice station cable (cut sheets) which detail the station number, telecom room, and riser pair number for each installed cross connection.

END OF SECTION – 27 10 00

28 05 29 HANGERS AND SUPPORTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for communications equipment, conduit, cable, boxes, and other communications work.

1.2 RELATED REQUIREMENTS

A. Division 01 – General Requirements
B. Division 03 - Cast-in-Place Concrete: Concrete equipment pads.
C. Section 260400 – General Conditions for Electrical Trades
D. Section 260529 – Hangers and Supports for Electrical Systems
E. Section 283100 – Fire Detection and Alarm

1.3 REFERENCE STANDARDS

A. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
B. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. See Division 01: General Requirements.
B. Coordination:
    1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components being installed.

2. Coordinate the work with other trades and provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

C. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
D. Installer's Qualifications: Include evidence of compliance with specified requirements.
E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.
B. Comply with latest adopted version of applicable building code, including any addendum or supplements.
C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
D. Installer Qualifications for Field-Welding: As specified in Section 260400 General Requirements for Electrical Trades.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 Refer to Section 260529 – Hangers and Supports for Electrical Systems. All Part 2 Product requirements listed in this Section shall also apply to Division 28 Electronic Safety and Security, except where specified otherwise herein.

2.2 J-HOOK SUPPORTS

A. Manufacturers:
  1. Easton/Cooper B-Line – “BCH” Series
  2. Caddy
  3. Chatsworth
  4. Substitutions: Division 01 - General Requirements

B. Product Description: Low-voltage and communication fasteners for routing of cabling from telecommunication room to work area outlet. J-hooks shall support all communications cabling in the project. Including, but not limited to, Category 6, 6A, fiber, speaker cabling, coaxial, security, and others.

C. Specifications:
  1. Pre-galvanized steel finish
  2. Static load capacity: 30 lbs
  3. Quick latching cable retainer

D. Furnish with all required connectors, fasteners and accessories.

E. J-Hooks shall be sized to correctly support the number of cables, which pass through them. Under no circumstances shall cable quantity exceed 50 in any given support. Fill capacity shall be as required by code for conduit. That is to say that every J-Hook shall have a maximum of 40 percent fill capacity. Install additional supports as required.

PART 3 EXECUTION

3.1 Refer to Section 260529 – Hangers and Supports for Electrical Systems. All Part 3 Execution requirements listed in this Section shall also apply to Division 28 Electronic Safety and Security, except where specified separately herein.

3.2 INSTALLATION – SECURITY SYSTEM SUPPORT COMPONENTS

A. Backboxes for communications devices shall be permitted to be supported from a grid ceiling. A tile bridge shall be furnished for this purpose. Refer to Section 26 05 33.

B. Overhead speakers, plenum boxes, audiovisual equipment, and other devices weighing more than a standard electrical backbox shall be supported via a threaded rod fastened to the building structure.

C. J-hooks shall be furnished with cable-to-beam fasteners and shall be fastened to the building structure.

D. Separate J-hooks shall be furnished and installed for different systems. The following systems shall be routed in separate j-hook pathways:

1. Data cabling
2. Speaker cabling
3. Security cabling

E. J-hook pathways shall be separated from power cabling by a minimum of 12 inches.

F. J-hook pathways shall be separated from the load side wiring of dimmer controls by a minimum of 24 inches.

END OF SECTION – 28 05 29

28 05 33 RACEWAY AND BOXES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Raceway and Boxes for Electronic Safety and Security Systems.

B. Related Sections:
  1. Section 260400 – General Conditions for Electrical Trades.
  2. Section 260526 - Grounding and Bonding for Electrical Systems.
  3. Section 260533 - Raceway and Boxes for Electrical Systems.
  4. Section 280529 - Hangers and Supports for Electronic Safety and Security.
  5. Section 280553 - Identification for Electronic Safety and Security.

1.2 REFERENCES

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC);
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S);
C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A);
D. NECA 1 - Standard for Good Workmanship in Electrical Construction;
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT);
F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit;
G. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC);
H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable;
I. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit;
J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit;
K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing;
L. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT);
M. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
N. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

O. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
Q. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
R. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
S. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
T. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
U. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
V. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
W. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
X. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
Y. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
Z. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
AA. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
BB. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
CC. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.3 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   2. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   3. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
  1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Division 01 – General Requirements.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for all conduits and fittings outlined in Part 2.
C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
D. Shop Drawings:
  1. Indicate proposed arrangement for conduits to be installed within or under structural concrete slabs, where permitted.
  2. Include proposed locations of roof penetrations and proposed methods for sealing.

E. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs (where permitted), and conduits 2 inch trade size and larger.
F. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
G. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Division 01 – General Requirements.
  2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General Requirements
B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
C. Protect PVC conduit from sunlight.
D. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

1.8 COORDINATION

A. See Division 01 – General Requirements
B. Coordinate installation of outlet boxes for equipment connected under Section 260503.
C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.
D. Security contractor is responsible to fully coordinate with the site and concrete contractors and all other trades when routing conduit underslab. Routing of conduit underslab may be acceptable, provided spacing of conduits is adequate for proper backfilling of area surrounding conduits. Adequate spacing shall mean using factory made conduit spacers that allow for a minimum of 3-inches for backfilling with sand or 3 times the pipe diameter for backfilling with a structural fill. Proposed conduit routing, installation and methods and backfilling procedures shall be submitted to the Engineer for review prior to installation.

PART 2 PRODUCTS

2.1 Refer to Section 260533 – Raceway and Boxes for Electrical Systems. All Part 2 Product requirements listed in this Section shall apply to Division 28 Electronic Safety and Security.

PART 3 EXECUTION

3.1 Refer to Section 260533 – Raceway and Boxes for Electrical Systems. All Part 3 Execution requirements listed in this Section shall apply to Division 28 Electronic Safety and Security.

END OF SECTION – 28 05 33

28 05 53 IDENTIFICATION FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security system identification requirements.
B. Identification nameplates and labels.
C. Wire and cable markers.

1.2 RELATED REQUIREMENTS (follow the most currently adopted amended version)

A. See Division 01 – General Requirements
B. Division 09 - Finishes.
C. Section 260400 – General Conditions for Electrical Trades.
D. Section 260553 – Identification for Electrical Trades.

1.3 REFERENCE STANDARDS (follow the most currently adopted amended version)

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.
B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.
C. NFPA 70 - National Electrical Code.
~~D.~~ NFPA 70E - Standard for Electrical Safety in the Workplace
E. UL 969 - Marking and Labeling Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
    1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
    2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Division 01- General Requirements

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General Requirements
B. Accept identification products on site in original containers. Inspect for damage.
C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.8 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature and humidity is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 Refer to Section 260553 – Identification for Electrical Systems. All Part 2 Product requirements listed in this Section shall also apply to Division 28 Electronic Safety and Security.

PART 3 EXECUTION

3.1 Refer to Section 260553 – Identification for Electrical Systems. All Part 3 Execution requirements listed in this Section shall also apply to Division 28 Electronic Safety and Security, except where specified separately herein.

3.2 INSTALLATION – SECURITY SYSTEM LABELING

A. Label Installation:
   1. All labeling standards shall be confirmed with and approved by owner’s IT staff prior to performing work. It is the responsibility of the contractor to coordinate with owner’s staff.

2. Labeling procedures shall meet TIA/EIA 568B Series standard and BICSI Standards and shall be pre-approved by the Owner.
3. Permanently label, using pre-printed labels, all cables and terminations.
    a. Patch panels and cross-connect blocks, numerically from top to bottom.
    b. Patch panel port with work area outlet label.
    c. Cable segments.
4. Install label parallel to equipment lines.
5. Use industry standard TIA/EIA and BISCI color codes.
6. Each work station outlet jack and corresponding patch panel port shall be marked with the same, unique label.
7. Mark the plate with standard nomenclature as required by the configuration. Mark the outlet plainly and neatly with its station identification, as indicated in above paragraph. The station identification shall also be marked inside the outlet plate on the backing plate of the outlet, and shall match the ID used at the patch panel port. Make the outlet marking using the Panduit system or equal, except for the inside marking which may be by indelible marker. Place exposed marking on outlet plates under a transparent window for protection. Label cable with permanent marker compliant with EIA/TIA 606, six (6) inches back from the termination at both ends.

B. Wire Label Installation:
1. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
2. Install labels at data outlets identifying patch panel and port designation as specified.

C. Conduit Marker Installation:
1. Install conduit marker for each conduit longer than 10 feet.
2. Conduit Marker Spacing: 20 feet on center.

END OF SECTION – 28 05 53

SECTION 28 09 50 – FUEL DISPENSER AND FUEL MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section covers furnishing and installation of a gasoline and diesel fuel dispensing, fuel management and reporting system, associated piping and connections, and accessories.

1.2 RELATED WORK

A. Section 33 56 13, Aboveground Fuel Storage Tanks

B. Section 28 40 00, Tank Gauging, Instrumentation, and Controls

C. Division 26, Electrical

1.3 QUALITY ASSURANCE

A. Install fuel dispensers in accordance with API and NFPA Standards, at a minimum.

B. Installation Contractor shall have a minimum of five years of experience in the installation of fuel dispensing systems on similar installs.

C. All of the equipment shall be of a proven design and shall have accuracies and ranges within the limits guaranteed by the manufacturers for the models specified.

D. The Specifications and Drawings call attention to certain design features required to provide an operating system meeting the functional description as specified herein. However, the Specifications and Drawings do not purport to cover all details entering into the design. As these systems vary between manufacturers, certain components required by one manufacturer may not be needed by another. The Contractor is responsible for installing a system which meets the functional requirements as stated herein.

E. The equipment described in this specification is based on the products of one manufacturer. This is not to limit competition but to indicate the quality of materials required. Other manufacturers who can provide equipment of comparable quality may be acceptable.

1.4 SYSTEM DESCRIPTION

A. Contractor shall furnish two (2) single product fuel dispensers with two (2) submersible pumps, fuel management system, and all required appurtenances for a complete and operational system.

B. A Massachusetts state licensed electrician shall perform all electrical work and the Contractor shall be certified by the state to install fueling systems, as appropriate, and shall perform all additional work as needed for a complete and operable system. All necessary wiring, connections, and electrical service requirements shall be provided by the Contractor. All data connections including a RS-422 terminal connection are to be provided by the Contractor.

C. The Contractor shall furnish fuel pump emergency shutoff switches to shut off power to all dispensing devices and all electrical components on the fuel island in the event of an emergency, as shown on the Drawings. At least one emergency shut-off switch shall be placed a minimum of 20-feet away and maximum of 100-feet away from the fuel island per NFPA 30A and, shall be weatherproof and placed within a weatherproof enclosure (NEMA 4X) in accordance with manufacturer’s recommendations. In addition, all components of the fuel system shall be weatherproof as appropriate. The Contractor shall provide a sign for the switches labeled “EMERGENCY PUMP SHUTOFF”. Approved signs bearing the wording “Extinguish All Smoking Materials”, and “Stop Engine While Refueling” shall also be conspicuously posted at both ends of the pump dispensing island visible to approaching vehicles. Approved signs required by NFPA shall consist of block letters not less than two inches in height and be either red letters on a white background or white letters on a red background.

D. Warning signs shall be posted on both sides of the tank next to the dispensers with the following; the “WARNING” and “NO SMOKING – STOP MOTOR” shall be in white block letters not less than one inch on a red background and the rest of the sign shall be in red block letters not less than 1/2-inch on a white background:

WARNING
NO SMOKING – STOP MOTOR
It is unlawful and dangerous to dispense gasoline into unapproved containers.
No filling of portable containers in or on a motor vehicle or trailer.
Place container on ground before filling.

E. The system shall be grounded in accordance with state and manufacturer’s requirements. System components shall be explosion proof.

F. Additional signs shall be provided if needed in accordance with local, state and federal requirements. Verify sign requirements with the local Fire Department in advance and modify as needed.

1.5 SUBMITTALS

A. Submit a complete set of shop drawings showing all interconnections of the components in each system. The Contractor shall show verification that the individual components are fully compatible and capable of performing the tasks.

1. Show complete details of construction and installation for each piece of equipment.
2. Include details of controls and instrumentation wiring.
3. Provide point-to-point wiring diagrams for equipment.
4. Provide a complete functional description of system operations.

B. Submit working drawings showing layout and complete details for piping installation.

C. Furnish proof of successful operating experience during the last five years on ten installations of equipment comparable to that specified.

D. Furnish operation and maintenance manuals for each component specified, including a recommended spare parts list with ordering numbers.

E. Furnish written certification by the manufacturer's representative verifying proper installation and function of the equipment.

F. Provide a complete set of design drawings certified by the manufacturer.

G. Contractor shall submit shop drawings showing the proposed pipe routing with appropriate valves and appurtenances necessary in order to provide a complete and operable system, certified by the manufacturer and installer for approval by the Engineer.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE PUMP:

A. Fuel dispensers shall pump fuel from the gasoline and diesel aboveground storage tanks. The single dispenser stations shall dispense a single product. Provide one (1) gasoline pump which will each pump to one dispenser, and one (1) diesel pump which will each pump to one dispenser as described below.

B. Contractor shall furnish pump, piping, dispensing station, electrical interconnections and all accessories required to provide complete dispensing and data management systems. Provide four submersible turbine pumps, Franklin Fueling Systems FE Petro Model STP75, ¾ hp for gasoline and model STP150 1.5 hp for diesel. Pumps shall be fixed speed, 3,400 rpm, two stage centrifugal type pumps, or approved equal. Incoming power shall be as shown on the Electrical Drawings. The pumps shall have integral, automatic thermal overload protection. The maximum flow rate shall be 65 gpm and max pressure of 31 psi. The starting and running capacitor with internal bleed resistor shall be rated 370 Volt, 15 microfarad and have a maximum motor draw of 7 amps. Pumps shall be UL and cUL listed for fuel mixtures containing up to 10% ethanol with gasoline and 20% MBTE, 20% ETBE, or 17% TAME with gasoline. The pumps shall also be equipped with a pressure relief check valve.

C. Contractor shall provide necessary fittings/piping to connect submersible pump to Schedule 40 steel fuel lines (coated per manufacturer requirements for corrosion protection) and to provide a complete and operable system as shown on the Drawings and as recommended by the manufacturer.

D. Pump shall be approved by the manufacturer for use with gasoline and diesel fuels.

E. Submersible pump shall be provided with a smart pump controller in accordance with manufacturer recommendations. The smart pump controller shall be mounted in the fuel island electrical cabinet.

F. Contractor shall provide necessary controls to run the pumps.

G. Pump controllers shall be interlocked with the tank gauging and monitoring system controller specified in Section 28 40 00 Tank Gauging, Instrumentation and Controls. The monitoring system controller shall be capable of shutting off the submersible pump if any operator-defined system conditions are not met or if any other operator-defined fueling system associated alarm is activated.

H. Pump shall be equipped with an automatic mechanical line leak detector.

2.2 DISPENSERS

A. Provide two (2) shelf-mounted dispensers. The dispensers shall distribute a single product through a single hose to Universal double poppet shear valve and shall be capable of delivering up to 22 gpm for gasoline and 30 gallons for Diesel fuel. For diesel fuel, two diesel pumps shall be provided with each one connected to a single diesel dispensers, with appropriate piping manifold and isolation shut-off valves so the dispenser can be shut off/isolated from the pump with appurtenances as needed. For gasoline, two gasoline pumps shall each be connected to two gasoline dispensers, with appropriate piping manifold and isolation shut-off valves so the dispenser can be shut off/isolated from the pump with appurtenances as needed.

B. The diesel dispenser shall be complete with the following features:

1. Super high capacity shelf-mount single remote dispenser with lane-oriented nozzle (1-inch nozzle for diesel) which is rated up to 30 GPM/114 LPM at the discharge. Designed for dispensing diesel, including biodiesel blends up to 20%; gasoline, including ethanol blends up to E25; and kerosene.

2. Compact design 31-inches or less in height that can be mounted on a shelf attached to a tank.
3. Class 1, Div. 2 hazardous location rated for installation directly next to an aboveground storage tank.
4. Electronic display. Mechanical register is not acceptable.
5. On side with nozzle boot, backlit 7-digit 1.5-inch liquid crystal (LCD) gallons display.
6. Display backup for a minimum of 15 minutes in the event of power loss.
7. Thermostatically controlled heater fan for cold temperatures.
8. Four-character ½-inch LCD operator message display to denote authorization status, cut-off limit, etc.
9. Separate display for error codes and indicating operating mode
10. All displays covered with tempered or double-strength glass (plastic not acceptable).
11. 120VAC, 60 hz operation.
12. Electromechanical totalizer, 7-digit non-resettable, located on front of dispenser for inventory control.
13. Electronic 6-digit non-resettable and resettable totalizers.
14. Diagnostics including log of last 50 errors/events. Dispenser software configurable and downloadable from PC.
15. Hand held remote control for accessing totals, diagnostics, & configuring dispenser via LCD w/o opening cabinet.
16. Dual pulse output interface for connection to fuel control and tank monitoring systems.
17. Cabinet: All exterior panels made from galvannealed steel for corrosion-resistance. Side panels 14-gauge minimum.
18. Finish: Powder-coated metallic silver sides, top, and base with green lower doors.
19. Front and rear doors shall be removable for dispenser service.
20. LED lighted brand panel labeled Diesel.
21. Lane-oriented nozzle boot with lift-to-start nozzle hook to turn on/off dispenser.
22. Two (2) positive displacement, two-piston meters connected to the same discharge for maximum flow.
23. Integral hall effect pulsers with no external parts to wear out.
24. Electronic calibration without the need to set mechanical adjusters.
25. Proportional solenoid valve on discharge of each meter, programmable thru electronic register to set maximum flow rate.
26. One (1) internal filter with 30-micron element to help ensure product purity.

27. One (1) 1-inch discharge outlet with a ¾-inch reducing bushing so that either a ¾-inch or 1-inch hose may be used.
28. One (1) 1.5-inch NPT inlet.
29. Terminal block in the electronic register to make all dispenser power and control wiring terminations.
30. Shelf bracket for mounting dispenser to tank. Black powder coat finish. Bracket for securing emergency valve.
31. Shelf Bracket P/N WP001128-0001-J021
32. Warranty: Two years parts and labor.
33. Standards/Approvals: ADA compliant user controls per ANSI A117.1; c-UL-us listed; FCC; W&M approvals.
34. Model & Manufacturer: Wayne Select S1 Model 3/G7127D/9GHRU/JL (Wayne Fueling Systems, Austin, TX) or approved equal.
35. Universal Valve anti-static discharge Model Zapper.
36. Provide UL listed diesel hoses with necessary high flow dispenser nozzles, hose support and retraction systems and breakaway valves.
37. Contractor shall provide all piping between the dispenser and the tanks including all fittings, valves, line strainer, external emergency valve, anti-siphon valves, unions, pressure relief valves, solenoid valves, ball valves, and vapor recovery piping as needed for a complete and operable system, which will allow for thermal expansion and trouble free operation.
38. Contractor shall provide each dispenser with a hose retriever system to allow duel sided fueling. Hose Retriever shall be made of a cast iron head and body, a stainless-steel cable with a steel base. The unit shall allow 360-degree rotation, also shall be compatible with E-85, and come with a 20 lb. counterweight. The unit shall be mounted on a 2” pipe and extend high enough to provide the length of hose specified on the drawings. The hose retriever shall be manufactured by Universal Valve Company or approved equal.

C. The gasoline dispenser shall be complete with the following features:

1. Enhanced capacity shelf-mount single remote dispenser with lane-oriented nozzle (3/4-inch nozzle for gasoline), boot, which is rated up to 22 GPM/83 LPM at the discharge. Designed for dispensing gasoline, including ethanol blends up to E25; diesel, including biodiesel blends up to 20%; and kerosene.
2. Compact design 31-inches or less in height that can be mounted on a shelf attached to a tank.
3. Class 1, Div. 2 hazardous location rated for installation directly next to an aboveground storage tank.
4. Electronic display. Mechanical register is not acceptable.

5. On side with nozzle boot, backlit 7-digit 1.5-inch liquid crystal (LCD) gallons display.
6. Display backup for a minimum of 15 minutes in the event of power loss.
7. Thermostatically controlled heater fan for cold temperatures.
8. Four-character ½-inch LCD operator message display to denote authorization status, cut-off limit, etc.
9. Separate display for error codes and indicating operating mode
10. All displays covered with tempered or double-strength glass (plastic not acceptable).
11. 120VAC, 60 hz operation.
12. Electromechanical totalizer, 7-digit non-resettable, located on front of dispenser for inventory control.
13. Electronic 6-digit non-resettable and resettable totalizers.
14. Diagnostics including log of last 50 errors/events. Dispenser software configurable and downloadable from PC.
15. Hand held remote control for accessing totals, diagnostics, & configuring dispenser via LCD w/o opening cabinet.
16. Dual pulse output interface for connection to fuel control and tank monitoring systems.
17. Cabinet: All exterior panels made from galvannealed steel for corrosion-resistance. Side panels 14-gauge minimum.
18. Finish: Powder-coated metallic silver sides, top, and base with blue lower doors.
19. Front and rear doors shall be removable for dispenser service.
20. LED lighted brand panel labeled Unleaded.
21. Lane-oriented nozzle boot with lift-to-start nozzle hook to turn on/off dispenser.
22. Nozzle boot shall accommodate UL standard interchangeable nozzles and short spout vapor recovery nozzles.
23. One (1) positive displacement, two-piston meter with integral hall effect pulser with no moving parts to wear out.
24. Electronic calibration without the need to set mechanical adjusters.
25. One (1) proportional solenoid valve, programmable through electronic register to set maximum flow rate.
26. One (1) internal filter with 30-micron element to help ensure product purity.
27. One (1) 1-inch discharge outlet with a ¾-inch reducing bushing so that either a ¾-inch or 1-inch hose may be used.

28. One (1) 1.5-inch NPT inlet.
29. Terminal block in the electronic register to make all dispenser power and control wiring terminations.
30. Shelf bracket for mounting dispenser to tank. Black powder coat finish. Bracket for securing emergency valve.
31. Shelf Bracket P/N WP001128-0001-J021
32. Warranty: Two years parts and labor.
33. Standards/Approvals: ADA compliant user controls per ANSI A117.1; c-UL-us listed; FCC; W&M approvals.
34. Model & Manufacturer: Wayne Select S1 Model 3/G7107D/29GHRU/JL (Wayne Fueling Systems, Austin, TX) or approved equal.
35. Universal Valve anti-static discharge Model Zapper.
36. Provide UL listed diesel hoses with necessary high flow dispenser nozzles, hose support and retraction systems and breakaway valves.
37. Contractor shall provide all piping between the dispenser and the tanks including all fittings, valves, line strainer, external emergency valve, anti-siphon valves, unions, pressure relief valves, solenoid valves, ball valves, and vapor recovery piping as needed for a complete and operable system, which will allow for thermal expansion and trouble free operation.
38. Contractor shall provide each dispenser with a hose retriever system to allow duel sided fueling. Hose Retriever shall be made of a cast iron head and body, a stainless-steel cable with a steel base. The unit shall allow 360-degree rotation, also shall be compatible with E-85, and come with a 20 lb. counterweight. The unit shall be mounted on a 2” pipe and extend high enough to provide the length of hose specified on the drawings. The hose retriever shall be manufactured by Universal Valve Company or approved equal.

2.3 FUEL MANAGEMENT SYSTEM

A. General Description

1. This specification outlines the performance and design prerequisites for a Fuel Management System, specifically the FUELMASTER 5000 Series Model FMU5725 (Stephen Petrovic – 850-518-4320), or an approved equivalent such as EJ Ward (Matt Gilbert – 203-539-9723) or Gasboy. The vendor is obligated to supply a self-contained system, capable of autonomous operation 24 hours a day, seven days a week.

2. The contractor shall provide supply 200 programmable Prokees (or equivalent) with the fuel management system.

3. Data from the fuel management system should be transmitted via a cellular modem to a cloud-based database. Furthermore, the fuel management system must be equipped with an interface kit for the tank monitoring system to allow for tank reconciliation.

B. Fuel Master 5000 Series (or approved equal):

1. Model Number: FMU5725 (Cellular, Prokee/Prox Card)
2. Features:
    a. Communication: Integrated Cellular, Encrypted Communications.
    b. Compliance: Weights and Measures Compliant, Fuel Security and Authorization, EMV Compliant.
    c. Hardware: Mechanical Dispensers, Tank Monitor Units, Automatic Firmware Updates, Advanced Surge Protection, Enhanced LCD Display, Pedestal Power Indicator Light, Illuminated Keypad.
    d. User Access Devices: Prokee
    e. Software Platform: FMLive (cloud-based)
    f. System Features: Invoicing, Exports, Reports, Automatic Software Updates, Inventory Management, User Accountability, Real-time Data, Real-time Alerts, Custom Ad-hoc Reports, Report Scheduling and Delivery, Centralized Dashboard, Customizable Roles & Permissions Settings.
3. Dimensions: Enclosure: 19”W x 13”H x 10”D, Pedestal: 12”W x 48”H x 6”D.
4. Certifications: UL-1238 Ed. 6, CSA C22.2 No. 22 (R2014), CSA C22.2 No. 142 (R2013), EN 61010-1:2010, FCC Certified.

C. PERFORMANCE

1. Durable: Operating temperatures ranging from -40F to +140F.
2. Customizable: User interface and settings shall be customizable such as email alerts.
3. Compatible: shall be compatible with dispensers and tank monitoring system
4. Tank Interface: Shall be equipped with a tank monitoring interface kit to receive data from the tank monitoring system.

2.4 INSTALLATION

A. All equipment and software covered under this section shall be installed in accordance with the requirements of the Owner.

B. The Contractor shall supply any wires, cables or power cords necessary for proper installation of the computer system and not supplied with equipment, at no additional cost to the Owner.

2.5 WARRANTY

A. The system must include a two-year warranty covering all components, including parts and on-site labor. The warranty period shall begin on the date of Substantial Completion.

2.6 TRAINING

A. A factory-trained Authorized Service Representative (ASR/ASC) shall provide a minimum of four hours of training as needed to train Owner’s personnel to use the system.

2.7 EMERGENCY SPILL KIT & WASTE BINS

A. Contractor shall provide and install a Hi-Viz Yellow emergency spill kit, which shall contain at a minimum the following:

a. 2 - 22 lb. bags of loose granular absorbent
b. 20 - 15” x 20” absorbent pads
c. 2 - 5” x 10’ absorbent socks
d. 2 – 42” x 42” catch basin blocker mat
e. 1 - Broom
f. 1 - Non-sparking shovel
g. 2 – Tyvek suits, or approved equal
h. 10 - 18" x 30" polyethylene disposal bags
i. 2 – Safety glasses
j. 2 - Nitrile Gloves
k. 56 - 11.8" x 13" all-purpose wipers
l. 1 - 7" Multi-purpose epoxy putty (2-year shelf life)
m. 1 - 110 Gallon Sump Capacity, Spill Kit Box with Lid, model #1624K by Eagle Manufacturing, or approved equal.

B. The Contractor shall also furnish and install one 50-gallon capacity black Landmark Series Classic Container with dome top frame and rigid liner, model #FG397500BLA, as manufactured by Rubbermaid Commercial Products LLC, Huntersville, NC, or approved equal. The Contractor shall furnish and install the bin with four (4) large decorative rock panels, SKU #FG40400ROCK, by Rubbermaid Commercial Products LLC, Huntersville, NC, or approved equal product compatible with the bin.

C. The Contractor shall furnish one 21-gallon capacity red Foot Operated Oily Waste Can with SoundGard, model #09704, as manufactured by Justrite MFG Co., or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION/TESTING

A. Install all systems to comply with API and NFPA Standards and Manufacturer’s installation instructions. Provide a complete and operational system and include all components and accessories, as required for a complete and operational system. All wiring shall comply with the NEC. All electrical work shall be performed by a Massachusetts Licensed Electrician thoroughly familiar with NEC and NFPA regulations related to fuel system installation.

B. The manufacturer’s engineering consultant will be required to furnish a point to point interface wiring diagram.

C. Contractor shall pay for and obtain all permits required for installation and operation of the fuel dispensing and management system.

D. All equipment and materials shall be inspected for damage sustained during shipment.

E. Contractor shall coordinate installation of fuel dispensing system with installation of the fuel tanks.

F. All electrical materials and installations shall be in accordance with code requirements and as required by the local Fire Department and State building codes.

G. The completed installation shall be inspected by an authorized manufacturer's representative and certified to be satisfactory in writing.

H. The system shall be tested in the presence of the Owner's representative and others as required, to the Owner's satisfaction.

I. Owner's operating personnel shall be trained in all aspects of system operation by a qualified manufacturer's representative, using the operating manuals provided.

J. The system shall be grounded in accordance with local, state and federal regulations, and in accordance with the manufacturers’ recommendations. The system shall be explosion proof.

K. The Specifications and Drawings show the general system components and not all components are specified. The Contractor is responsible for providing all equipment, materials, labor, and components necessary for a complete, fully permitted and operable system in accordance with local, state, and federal regulations, and in accordance with manufacturer’s recommendations.

L. The fuel system installer shall be licensed with the State of Massachusetts to install petroleum fueling systems, as appropriate.

END OF SECTION 28 09 50

28 31 00 FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections with DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
B. Attention is directed Section 26 0400 – GENERAL CONDITIONS FOR ELECTRICAL TRADES, which is hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section includes fire alarm cable connection from existing local fire alarm control panel and fuel island fire alarm control panel with nitrogen bottle (provided by the general contractor).
B. Related Sections:
  1. Division 07 – Firestopping
  2. Division 08 – Hardware (for magnetic door hold open devices)
  3. Division 21 – Fire Protection (for flow detection devices)
  4. Division 23 – HVAC (for smoke dampers and fire/smoke dampers)
  5. Section 26 05 19 – Building Wire and Cable
  6. Section 26 05 26 – Grounding and Bonding
  7. Section 26 05 33 – Identification for Electrical Systems, for labeling and identification requirements.

C. Allowances: Refer to Division 01 Section “Allowances” for lump-sum allowance for additional fire alarm devices.
D. Alternates: Refer to Division 01 Section “Alternates” for description of Work of this Section affected by alternates.
E. Unit Prices: Administrative and procedural requirement for unit prices for fire alarm and carbon monoxide devices are specified in Division 1 Section “Unit Prices”.

1.3 REFERENCES

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; current edition.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. NFPA 72 - National Fire Alarm and Signaling Code
D. NFPA 101 - Life Safety Code
E. NFPA 601 - Standard for Security Services in Fire Loss Prevention

1.4 SYSTEM DESCRIPTION

A. This section of the specification includes fire alarm cable.
B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Local Protected Premises Signaling Systems except as modified and supplemented by

this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

1.5 SUBMITTALS

A. Division 01: Submittal procedures.
B. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection.

1.6 CLOSEOUT SUBMITTALS

A. Division 01: Closeout procedures.
B. Project Record Documents: Record actual locations of fire alarm equipment.
C. Operation and Maintenance Data: Submit manufacturer’s standard operating and maintenance instructions.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.
B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
C. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.
D. Installer Qualifications: Company specializing in installing the products specified in this section with minimum three years documented experience, and certified by the State as fire alarm installer.
E. Products: Listed and classified by Underwriters Laboratories, Inc as suitable for the purpose specified and indicated.

1.8 MAINTENANCE SERVICE

A. Division 01: Maintenance service.
B. Furnish service and maintenance of fire alarm equipment for one year from Date of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.

1.10 COORDINATION

A. Division 01: Pre-Installation conferencing.
B. Coordinate the installation of cable and equipment with other construction activities and the work of other sections.

1.11 WARRANTY

A. Contractor's Warranty: Warranty the installation to be free of defect for a period of two (2) years.
B. Equipment Warranty: Each piece of equipment shall carry a two(2) year manufacturer's warranty.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Notifier (Basis of Design)
B. Edwards
C. Siemens
D. Tyco SimplexGrinnell
E. Substitutions: See Division 01 – Product Requirements

2.2 CONDUIT AND WIRE

A. Fire alarm cabling shall be wire in conduit.
B. Conduit:
    1. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.
    2. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
    3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
    4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as

initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.
7. All fire alarm junction boxes and raceways shall be identified and labeled in accordance with Section 26 05 33, “Identification for Electrical Systems”.

C. Wire:
   1. All fire alarm system wiring shall be new.
   2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63 mm) for notification appliance circuits.
   3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
   4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
   5. Wiring used for the SLC multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication loop.
   6. All field wiring shall be completely supervised.
   7. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs).

D. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 01: Coordination and project conditions.
B. Verify products and systems receiving devices are ready for installation.

3.2 INSTALLATION

A. Division 1 - Quality Control: Manufacturer's instructions.
B. Install 16 AWG minimum size conductors for fire alarm detection and signal circuit conductors, or as indicated on drawings.
C. Connect conduit and wire to fire suppression system control panels.

D. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

E. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.

3.3 MANUFACTURER'S FIELD SERVICES

A. Division 01: Manufacturer’s field services.

B. Include services of factory certified technician to supervise installation, adjustments, final connections, and system testing.

3.4 TEST

A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72 and the following:

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all waterflow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.5 FINAL INSPECTION/ ACCEPTANCE TESTING

A. Division 01 – Quality Control.

B. At the final inspection, a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

C. Fire Alarm/Acceptance Testing Procedures:

1. The fire alarm testing shall be as the authority having jurisdiction shall dictate. This will be as determined by the AHJ and shall include, but not be limited to, the requirements as set below:
    a. Protective Signaling Systems: All protective signaling systems shall meet with acceptance testing requirements of the applicable standards listed in NFPA 101 and NFPA 13.
    b. Prior Test Notification: At least five (5) working days prior to testing, the Electrical Contractor shall notify (in writing) the following people of the proposed date the acceptance tests are to be performed:
        1) Authority Having Jurisdiction
        2) General Contractor or Construction Manager
        3) Engineer of Record
        4) Equipment Supplier Representative
        5) Sprinkler Contractor (if applicable)
        6) HVAC Contractor (if applicable)
        7) Elevator Contractor (if applicable)

D. Certificates of Compliance:
    1. A Fire Alarm System Inspection and Testing Certification and Description form shall be prepared for each system per the requirements listed in NFPA 72, Chapter 7.
    2. After the completion of the operational acceptance tests and sign-off of test witness (with stipulations noted), final copies of the Certificates shall be forwarded to the AHJ.

E. Tests:
    1. All tests shall be conducted in accordance with the Manufacturer’s Testing Recommendations.
    2. All testing equipment, apparatus (i.e. sound level decibel meter, 2-way radio communication, test devices, ladders, tools, lighting, etc.) and personnel shall be supplied by the Electrical Contractor.

3.6 INSTRUCTION

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the Owner.

C. Manufacturers representative shall provide Owner with a minimum of four (4) hours of onsite training on system. This training shall be followed up with an additional four (4) hours of onsite instruction at the discretion of the Owner, at any time during the warranty period.

END OF SECTION – 28 31 00

SECTION 28 40 00 – TANK GAUGING INSTRUMENTATION AND CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall furnish all labor, materials, tools, and equipment, to install all instrumentation and controls associated with the Gasoline and Diesel ASTs and related work, as specified herein, and as required by the Contract Documents.

1.2 QUALITY ASSURANCE

A. Installation of all systems shall be performed by a Contractor who possesses an Installer's License and is certified by the equipment manufacturer. The Contractor shall have a minimum of five years of experience.

B. The Contractor shall purchase the systems from a manufacturer approved by the Engineer. The manufacturer shall maintain a service depot within 150 miles of the facility. The service depot must be capable of timely delivery of parts and service personnel for servicing the system at any time. The manufacturer shall furnish required supervision, as required by the Engineer for the installation of the systems and shall furnish an experienced installation and maintenance worker for the supervision of personnel in the initial operation and maintenance of the systems.

C. The Contractor shall install compatible components and shall perform all modifications necessary for the proper operation and guarantee of the equipment. The Engineer reserves the right to require the Contractor to make such tests, during the installation and upon the completion thereof, as may be necessary to demonstrate that the work and equipment, as installed, complies with the Contract Specifications and requirements provided herein. The Contractor shall provide all labor, instruments, and apparatus required for such tests. If any of the work or equipment fails to meet the Contract Requirements or to function properly, the defects shall be rectified at the Contractor's own expense by readjusting, or by removing and replacing the faulty work or equipment until, under test, the requirements are met. The Engineer reserves the right to check the Contractor's instruments or to furnish its own instruments.

1.3 REFERENCES

A. The following standards form a part of this specification and indicate the minimum standards required:

NFPA	National Fire Protection Association
ANSI	American National Standards Institute
ASTM	American Society of Testing Materials (ASTM International)
ASME	American Society of Mechanical Engineers
NEC	National Electric Code
ISA	Instrumentation Society of America
NEMA	National Electrical Manufacturers Association

IEEE	Institute of Electrical and Electronic Engineers
API	American Petroleum Institute

1.4 SUBMITTALS

A. Shop drawings:
   1. Wiring and schematic diagrams certified by the manufacturer to meet NFPA/NEC explosion proof requirements and any other details required to demonstrate that the system has been coordinated and will function properly as a unit. Site specific, sealed electrical drawings shall be furnished by the manufacturer.
   2. Equipment and instrument list, including size, input/output types, expected range of operation, utility requirements, and materials of construction. A Bill of Materials also shall be included and keyed to the drawings. The Bill of Materials shall provide sufficient information to determine compliance with the Contract Drawings and Specifications.
   3. Drawings showing the proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work, including clearances for maintenance and operation.
   4. Manufacturers' descriptive and technical literature, including catalog cuts.
   5. Legends for name plates.
   6. Equipment certifications and test reports.

B. Operating and maintenance instructions shall be provided for each different type of control, instrument, and system.
   1. Operating instructions outlining the procedures required for equipment and system start-up, operation, and shut-down. The instructions shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and their basic operating features.
   2. Maintenance instructions listing routine maintenance procedures, possible breakdown and repairs, and troubleshooting guide.

C. Performance Test Reports: Upon completion and testing of the installed system, test reports shall be submitted showing that all field tests are performed to adjust each component and that all field tests are performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of the controls.

1.5 MANUFACTURER'S SERVICES

A. The Contractor shall provide the services of a manufacturer's engineering consultant who is experienced in the installation, adjustment, and operation of the instruments and controls to be provided, and who shall supervise the installation, adjustment, and testing of the equipment.

B. The leak detection/inventory control system shall include a minimum one-year warranty from the date of substantial completion.

1.6 FIELD TRAINING

A. The Contractor shall provide a field training course for the Owner and its designated operating staff. Training shall be provided for a total of 4 hours of normal working time and shall be completed prior to the system's final acceptance by the Owner. Field training shall cover all of the items contained in the operating and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL SYSTEM SPECIFICATIONS

A. Description
1. A continuous monitoring and leak detection system shall meet the performance specifications and functions of the Veeder-Root Company TLS4 tank monitoring system or approved equal.
2. The storage tank monitoring system shall meet all applicable standards and regulatory agency requirements including, but not limited to, the standards and requirements of the following:
    a. American National Standards Institute (ANSI)
    b. American Petroleum Institute (API)
    c. American Society for Testing and Materials (ASTM International a.k.a. ASTM)
    d. Environmental Protection Agency (EPA)
    e. National Bureau of Standards (NBS)
    f. National Electrical Code (NEC)
    g. National Fire Protection Agency (NFPA)
    h. Underwriters Laboratories Inc. (UL)
    i. Canadian Standards Association (CSA)
    j. Canadian Underwriters Laboratories Inc. (cUL)
    k. Federal Communications Commission (FCC)
3. The storage tank monitoring system shall meet all applicable standards to operate in a Class 1 Division 1 Group D hazardous location.

B. System Security
1. The system shall allow setup of users with different levels of security, limiting access to unauthorized personnel to areas such as Setup and Diagnostics. System Security will require login credentials for access to the GUI, Web- Enabled, and RS-232 communication. System Security will automatically log a user out after 15 minutes of inactivity.
2. The system shall have three predefined roles: Administrator, Operator, and Regulator with the following access permissions:
    a. Administrator: Able to edit console configuration, perform software upgrades, generate reports, and start various diagnostics tests. Also, able to create new roles and users.
    b. Operator: Able to view and generate reports and perform certain manual functions, like a manual delivery.
    c. Regulator: Able to print and review console reports.
3. The system shall have the ability to create custom roles, allowing the administrator to select access to: Diagnostics, Reports, Setup, System Status, and System Administration.

2.2 ENVIRONMENTAL COMPLIANCE SPECIFICATIONS

A. In-Tank Leak Detection
  1. Static Leak Detection (SLD)
    a. The system shall utilize Magnetostrictive probes with six thermistors for liquid level measurement, in-tank leak detection and temperature measurement.
    b. The tank gauge shall be capable of performing a static tank tightness test to an accuracy of 0.1 GPH with at least a 98% probability of detection [P (D)] and no more than 1% probability of false alarm [P (FA)].
    c. The system shall have the ability to automatically run a static leak test, by monitoring the activity of the submersible pump. Depending on the idle time between pumping cycles, the system will automatically run a 3.0 GPH test, a 0.2 GPH test or a 0.1 GPH test. Each successive test will start automatically upon completion of the previous test. If a dispensing transaction or a delivery takes place, the system will automatically disable the test until the next appropriate idle period.
    d. The system shall be capable of performing a 0.2 GPH or 0.1 GPH test to start automatically or manually and have the ability to run a quick leak test. This quick static leak test will take one hour, and commence 30 minutes after the last dispensing cycle, or five hours from the last delivery, whichever is greater. The minimum time for a 0.2 GPH static test shall be two hours and three hours for a 0.1 GPH static leak test.
    e. The system shall post a warning and or alarm after a specified number of days have passed (0-30) since the last leak test was run or successfully passed.
  2. Continuous Statistical Leak Detection (CSLD)
    a. The system shall have the ability to conduct automatic CSLD tests without the need to shut down tanks for scheduled test times.
    b. The system, when operated in CSLD mode, shall be third-party certified for statistical leak detection in single tanks up to 45,000 gallons and 37,000 gallons on manifold tanks. The test shall meet or exceed U.S. EPA standards with a 99% probability of detecting a 0.2 GPH leak and less than a 0.1% probability of false alarm. It shall meet Federal, State and local compliance requirements for monthly monitoring.
    c. The system shall be capable of dynamically qualifying the idle time data and selecting the best available data to perform a 0.2 GPH tank tightness evaluation. During each idle period an evaluation will be performed and the data will be added to the database. The system shall employ the use of dynamic feedback variables in the algorithm to evaluate the noise factor patterns associated with a tank, thus tailoring the algorithms to each individual tank.

B. Interstitial Leak Detection
  1. Dry Monitoring
    a. The system shall be able to perform automatic, continuous leak sensing in the dry interstitial space (annulus) of a double-wall tank, to detect a breach in the inner or outer shell. The system shall differentiate between hydrocarbons and water, and provide an indication of a fuel alarm or a liquid alarm.
    b. The system shall have the ability to sense the presence of hydrocarbons and/or liquid and provide an alarm for worst-case condition (fuel). The system shall have the ability to continuously monitor the integrity of the sensor for an open condition, alarm condition, or normal operating condition.

c. Provide monitoring sensors to monitor tank's interstitial space (one for each tank).

2.3 REPORTING

A. Generation
  1. The system shall have the ability to generate reports from the GUI, Web-enabled, or via a RS-232 command (display/computer format). These reports will provide the same information independent of how the report request is generated. The system shall have the ability to store up to three years' worth of report data.
  2. Reports can be scheduled to auto generate on date and time and have selectable date range for data review.

B. Output
  1. All reports shall be available from a network printer, fax, modem, email or from a polling computer. A four-line, twenty-character customer location header to identify the site must be user-programmable. The header must appear automatically on inventory status reports, leak detection reports and automatic delivery reports each time they are printed.

C. Alarm
  1. The system shall have the capability to generate an Active Alarm Report, Alarm History Report and Priority/Non-Priority Report. The console shall continuously monitor all probes and sensors, reporting not only normal operating conditions, but also system malfunctions or failures.
  2. System shall accept input from an external acknowledge switch to acknowledge the alarm and silence the buzzer.
  3. System shall have the ability to print out the alarm when the alarm is generated and E-mail alarm conditions to designated personnel.

D. Environmental
  1. The system shall provide the following reports related to Environmental Compliance.
    a. Combined Tank Test shall provide a report of both SLD and CSLD test results. This report will only show tests that have successfully passed.
    b. Sensor History shall provide reports anytime a sensor has gone into an alarm and when the alarm cleared. The report shall also indicate the type of alarm. The report shall report "Normal" if the sensor has never been in alarm.
    c. Sensor History provides proof of compliance to regulators. This report can be generated on a daily, weekly, or monthly basis or as programmed by the end-user.
    d. Sensor Status shall report the current status of all enabled sensors.

E. Units of Measure
  1. The system shall monitor inventory in U.S., Metric or Imperial units for up to four above ground and underground tanks; and produce a combination of automatic and manual inventory reports for each tank, which includes the following information:
    a. Tank identification
    b. Fuel volume / height
    c. Temperature-compensated fuel volume
    d. Ullage
    e. Water height / volume
    f. Fuel temperature

g. Time and date

F. Inventory

1. The system shall provide an inventory history of up to 720 records per tank.
2. The system shall be able to monitor underground and above ground storage tanks in single or manifold configurations.
3. The system shall be able to monitor (measure) API listed products including, but not limited to motor fuels, LPG, methanol and alcohol blends. The system shall be able to measure density for gasoline and diesel.
4. The system shall have the ability to generate a power outage inventory report. This report shall track inventory levels before and after power outage, any variation in volume shall indicate tank activity during the outage.
5. The system shall have the ability to set User Ullage from 90% to 100% of Maximum Volume.

G. Delivery

1. The system shall automatically generate an inventory increase report (Delivery) when a delivery of product to a tank has taken place. The report shall include the time and date of the delivery, the starting volume in the tank, the ending volume in the tank, the starting temperature of the fuel, the ending temperature of the fuel, and the inventory increase amount. The system shall have the ability to generate a power outage delivery report in the event power is lost during a delivery. This report will be automatically generated once the power is restored.
2. The system shall have the ability to generate a ticketed delivery reports using the BIR data and customer’s Bill of Lading.
3. The information shall be available in U.S., Metric or Imperial units. The system shall have the ability to store up to three years of inventory increase reports. The system shall provide an automatic delivery report, programmed to print from 1 to 99 minutes after a bulk delivery to a tank is complete.

H. Timed Sudden Loss

1. The system shall be able to detect sudden losses in the tanks when not dispensing and generate alarms when the threshold has been exceeded. Timed Sudden Loss shall not require pump sense and is programmable for seven individual time periods or shall be able to be manually started and stopped. Timed Sudden Loss shall be able to be reset once an alarm is posted.

2.4 SYSTEM PROGRAMMING

A. Interface

1. The system shall be able to be programmed via the 7-inch color touch screen or using Web-Enabled (Remote Access).
2. The system shall have an Acknowledge switch for consoles without the touch screen.

B. Online Context Help

1. The system will provide an online context help to assist with programming. The system shall also have Table of Context search capabilities.

C. Setup Wizard

1. The system shall be able to be programmed using a Setup Wizard from either the touch screen or Web-Enabled. The Setup Wizard will navigate through a comprehensive routine to ensure all fields are properly configured.

D. Languages
   1. The system will support the following languages: Arabic, Chinese, English, Finnish, French, German, Hebrew, Hindi, Italian, Korean, Portuguese, Polish, Russian, and Spanish.

E. Security
   1. The system shall provide the use of a security code to prohibit unauthorized entry to the systems set-up parameters. The system security code shall be entered through the user interface or through the external communications interface. The security code shall have the capability of containing alpha or numeric characters.

F. Set-Up
   1. The system will maintain programming and reports in the event of a power loss. The system will be connected to the DPW's computer network/server so that anyone that has access to the network, and has authorization, may view the system status and receive alarm condition email alerts.
   2. Set-up parameters shall include but not limited to the following:
      a. Automatic Events
      b. Communication
      c. Custom Alarms
      d. Date and Time
      e. Delivery
      f. Devices
      g. Display
      h. Headers
      i. Inventory
      j. Overview
      k. Printers
      l. System
      m. Tank
      n. Tank Chart

G. Email
   1. The system shall have the ability to send emails using SMTP protocol in response to any console alarm or at a pre-programmed time.
   2. The system shall store email contacts in a system address book.
   3. The Contractor shall connect the tank monitoring system to the Owner's server so that it can be accessed by the Owner's employees at desktop computers and so email notifications of alarm conditions can be received.

H. Backup
   1. The system shall have the ability to perform database backups and restore via a USB thumb drive.

I. Software Upgrades
   1. Remote Software Download

        a. The system shall have the ability to perform Remote Software Downloads, where new software is automatically downloaded to the system and stored until activated. Activation shall complete the Software Upgrade process.
    2. Thumb Drive Download
        a. The system shall have the ability to perform Software Upgrades, where new software is downloaded and activated via a thumb drive to the system. The Owner shall also be able to download the data from the system locally using a thumb drive.

J. Custom Alarms
    1. The system shall allow all system alarms to be programmed with a custom message up to 19 characters long. Each Custom Alarm shall have the ability to activate or suppress the console alarm beeper, LED indicators, and be displayed on the GUI and in the Alarm Reports.

K. Favorites
    1. The system shall allow commonly used GUI screens to be saved under the Favorite's icon for quick and easy navigation. The system shall allow for editing and deleting of saved locations in Favorites.

2.5 DIAGNOSTICS

A. All diagnostic information shall be generated by the system itself. The system shall not allow the user to change or enter diagnostic information in any way, except for Density Offset Diagnostic. The system will provide an intuitive online help to assist with diagnostics. The following diagnostic information shall be included in the system:
    1. Boot-up
        a. The system shall include built-in Boot-up diagnostics, which will display where in the sequence the console is currently at.
    2. System
        a. System Diagnostics shall include: Module, RS-232, and power reset history.
        b. Module Diagnostics shall display the hardware configuration to include board serial number and firmware revision.
        c. RS-232 Communication monitoring to include bytes transmitted/ received, parity errors, overruns, and framing errors.
        d. Power Reset history will monitor when the console was powered down and up.
    3. Probe
        a. Probe diagnostics shall include probe type, serial number, probe length, factory calibrations, probe options, and communication status.
    4. Tank Test
        a. Tank Test shall include test results for both SLD and CSLD.
            1) SLD
                a) SLD diagnostics shall include the following: In-Progress, Last Test, and History.
                    i) In Progress shall display current test status, test type, test result, start time, start volume, leak rate, and threshold.
                    ii) Last Test shall display the start date and time, test results and reason if the test did not pass for the previous SLD test.

            iii) History shall display all previous test results with start date and time, test results, duration, leak rate, tank volume, and %volume.
        b) SLD diagnostics shall include the ability to perform a manual tank test.
    2) CSLD
        a) CSLD diagnostics shall include Test Status, Rate Test, Rate Table, and CSLD State Changes.
            i) In Test Status shall display the current status of the CSLD test and how long the test has been in the current status.
            ii) The Rate Test shall display the overall status of the CSLD tank test based on an evaluation of all CSLD test results stored in the Rate Table. This diagnostic shall include compensated and uncompensated leak rate, total test time, average volume during tests, total count of test records and count of acceptable test records.
            iii) Rate table shall store the previous 28 days or 80 test results. The rate table shall display the date and time of the test, leak rate, temperature readings of the fuel and ambient air in the tank, the evaporation rate in the tank, the volume of the last delivery and test interval.
            iv) Monthly shall display any change of state of the status of CSLD. Change of state shall include a failed test, warning, passed test, no data, increase or no idle data.

5. Manual Calibration
    a. The system shall have the ability to perform a manual tank calibration by either using a meter drop or meter dispense method, where fuel is either delivered or dispensed from the tank in a controlled measured amounts.
6. Sensor
    a. Sensor diagnostics shall display the sensor type, category, and sensor status.

2.6 PRODUCT SPECIFICATIONS/CAPACITIES

A. Console
1. The console shall be of a modular design that allows for the installation and expansion of console hardware and additional optional features in the future. The console shall support up to twelve intrinsically safe wiring ports, two high-power dry contacts, one low voltage external input and up to three communication devices (five ports).
2. The console shall be equipped with 7-inch Full WVGA LCD touch screen display with an aspect ratio of 16:9, for on-site viewing of information, programming, operating and reporting functions. The touch screen shall be self-calibrating.
3. The front panel shall have three indicators to provide a visual indication of power on, warning and alarm conditions along with an internal audible alarm.
4. The console shall be capable of printing to a USB or network printer. Reports shall be printed in rows/columns format.
5. The console shall be equipped with the ability to communicate directly with an external POS terminal, printing device or PC. The system shall also have the ability to communicate with a remote device via serial, telephone lines, satellite or Ethernet.

6. The system shall store console setup and compliance data in non-volatile memory and have a battery backup for data storage in volatile memory.
7. The console shall be wall mounted using internal mounting holes and be equipped with four 3/4-inch to 1-inch conduit knockouts on the top and the bottom of the monitor for conduit entry into the monitor. One conduit entry (top and bottom) shall be designed for access to the universal module.
8. The overall dimensions shall be 8-inch by 13-inch by 3.5-inch.
9. The console shall have an internal quick-disconnect connector for 120/240 VAC wiring to the console for ease of installation, service and troubleshooting.
10. The console shall have an operational temperature range of 32° F (0° C) to 109° F (40° C) and shall be mounted in an area protected from severe vibrations, humidity, rain, and other conditions that could harm computerized electronic equipment.
11. The overfill alarm with acknowledgment switch shall be the audible horn and flashing light type. The overfill alarm shall be supplied with an alarm acknowledgement switch, and shall be weather proof for outdoor use. Alarm electronics shall be capable of operating from -40 degrees F. The alarm and acknowledgement switch shall be as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
12. Remote alarms shall also be provided as indicated on the drawings.
13. Two tank stick gauges shall be provided to manually monitor each tank (one per tank).

B. Modules
  1. The tank monitoring system shall incorporate a modular design to allow the factory installation of system features to meet specific application requirements, as well as field installation/modification of features at a later date to meet changing business, environmental compliance or regulatory requirements.
  2. Universal Sensor Input Output Module (USMIO)
    a. Shall support probes and sensors up to:
      1) Twelve (12) two-wire; six (6) three-wire inputs.
    b. Shall support two dry contact output relays.
    c. Shall support one low voltage inputs (<=12Vdc)
  3. The system shall have the ability to contain up to five modules. The modules shall consist of standard communication and optional communication modules.
  4. Standard Communication Modules shall include:
    a. Ethernet interface module: provides connectivity to local and wide area networks.
    b. Dual Ethernet interface module: provides connectivity to local and wide area networks (LAN/WAN). Each interface is a separate Ethernet connection providing two distinct networks.
    c. Dual USB interface module: supports USB thumb drive.
    d. RS-232 dual interface module: provides two 9-pin D-connectors for data transmission to POS terminal or computer. Supports RS-232, satellite, Electronic Dispenser Interface Module (EDIM).
    e. Optional Communication Modules shall include (Each system can accept up to two optional modules.):
    f. Dual Ethernet interface module: provides connectivity to local and wide area networks (LAN/WAN). This interface is a separate Ethernet connection providing two distinct networks.
    g. Current Loop Dispenser Interface Module (CDIM)

C. Manufacturer’s Support/Field Service

1. The manufacturer shall provide technical phone support available to customers from 8:00 a.m. to 7:00 p.m. EST, Monday thru Friday.
2. The manufacturer shall maintain a nationwide field service staff to provide on-site customer support and training, as well as overseeing installation of tank monitoring system by installation contractor. The distributor/contractor field service representative shall be available for on-site training of company maintenance personnel on installation, programming and troubleshooting of tank monitoring system.
3. The manufacturer shall supply a formal list of all Authorized Distributors and Service Contractors for sales, installation, training and support.
4. The manufacturer shall require and provide mandatory certification training for all of its authorized distributors and service contractors/installers. The certification program shall consist of two certification levels covering installation, setup/operation and service/troubleshooting of the manufacturer’s ATG monitoring systems. The manufacturer shall offer re-certification training to keep contractors/installers current with updated information.

D. Manuals
   1. The manufacturer shall supply product documentation that addresses the following categories as additional support:
      a. Site preparation and installation instructions
      b. System setup instructions (via on-line help)
      c. System operating instructions (via on-line help)
      d. Individual sensor installation instructions
      e. Probe installation instructions
      f. Individual module installation instructions
      g. Product data sheets
      h. Troubleshooting and repair manuals
      i. Wiring diagrams which include the following:
         1) Identification of all devices and equipment terminals, and all external connection terminal blocks.
         2) All external wiring connections with approved wire colors and circuit designations.
         3) Serial communications manuals.

E. System Warranty
   1. The tank monitoring system shall be warrantied for a period of one year from date of Substantial Completion. The warranty is to include parts and labor, with all warranty work performed on site by an authorized manufacturer's representative.

F. Warranty Registration and Checkout Form (WRACO)
   1. The manufacturer shall require that all ATG monitoring systems be started up by an authorized distributor. The startup shall consist of installation checkout, operation checkout and customer training on use of the equipment.
   2. The manufacturer shall supply a WRACO to properly document the site information.
      a. Installation location
      b. Installer
      c. Equipment identification
      d. Tank information
      e. Leak detector information
      f. Start-up distributor information

g. Customer approval

3. Upon receipt of the WRACO, the manufacturer will initiate the system warranty and input the data into a site database.
4. The manufacturer shall offer Authorized Distributors pre-selected parts kits to service AST monitoring systems.
5. Delivery: the manufacturer shall have the ability to ship tank monitoring systems in three (3) working days from the time that an order is entered into the computerized system to the ship date.
6. ISO-9000: the manufacturer shall maintain an ISO-9001 rating ensuring quality management of design, manufacturing, training and technical documentation.

2.7 LEAK DETECTION AND INVENTORY CONTROL SYSTEM

A. The following shall apply to both the gasoline and diesel USTs:

1. Two (2) magnetostrictive technology type, stainless steel inventory control and in-tank leak testing probe assembly (one per tank.)
2. Two (2) annular space liquid sensing probe for interstitial space (one per tank.)
3. The annular space liquid sensing probe shall be capable of detecting liquids in the interstitial space between tank walls. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -20 degrees Celsius to +70 degrees Celsius. Annular space sensor shall be Series 7943 Interstitial Sensor for steel Tanks, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Twelve-Input Type A Sensor Interface Module, Model No. 860199-120 TLS4i, as manufactured by Veeder-Root, of Simsbury, Connecticut, OPW, Franklin Fueling or approved equal.

B. Third-Party Certification: the manufacturer shall supply third-party documentation for all products, certifying that performance meets or exceeds EPA requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation of all equipment shall be in accordance with building codes, and the NFPA, NEC, and NEMA codes. The Contractor shall furnish and install all required conduit sealing fittings, explosion proof accessories, and NEMA Type 7 enclosures where indicated on the Contract Drawings, or where required by Code, or both.

B. The locations shown for instrumentation and control equipment on the Contract Drawings are approximate. The Contractor shall locate the new TLS-4 controller in the heated electrical cabinet as shown on the plans. All power and control wiring and connections not specifically indicated on the Contract Drawings, but required for the proper operation of equipment shall be made by the Contractor in accordance with these Specifications. All electrical control and instrumentation equipment installed in Class 1 hazardous locations shall be installed in NEMA Type 7 enclosures. Conduits and wire ways leading to and from these areas shall be provided with sealing fittings. All non-conducting metal parts of switches and controls shall be rust-proofed by galvanizing, cadmium plating, baked enamel or by the use of a non-corroding metal. Springs, wherever used, shall be a phosphor bronze.

C. Each leak detection inventory control system shall be installed, programmed and adjusted in accordance with the manufacturer's instructions so that all components function properly. Each overfill alarm and alarm acknowledgement switch shall be programmed and adjusted so that the alarm is activated at 90 percent of the tank capacity, unless noted otherwise.

D. All electrical work for tank gauging, instrumentation and controls shall be by a Massachusetts Licensed Electrician.

3.2 TESTING

A. General: All equipment (hardware and software) shall be factory and field tested to demonstrate that it provides the specified functions.

B. The factory and onsite test procedures shall be submitted to the Engineer for approval prior to starting the actual tests.

C. The onsite testing shall include checking of cables, testing of system subassemblies and checking of connections for each component and for the entire instrumentation and control system.

D. The Contractor shall notify the Engineer in writing that he is ready and desires to start the on-site system testing. The Engineer will authorize start of the testing at a mutually-agreed starting date.

E. Shop Testing: All activating devices, instruments and assemblies furnished under this item shall be set up in the shop of the manufacturer and tested over the full range of the equipment. The equipment shall satisfactorily perform all the functions within the requirements of the Specifications.

F. Field Testing: All instruments and systems shall be field tested to ensure conformance with the Specifications. Control systems shall receive dynamic loop tests which shall conform to the intent of ANSI: MC4.1 (ISA-S26). The control systems and equipment shall include provisions for such testing.

G. Input signals for equipment control shall be simulated for at least five signal values from 0 to 100 percent signal, with corresponding equipment response to be manually recorded, and adjustments made as required. Output signals from the equipment shall be read for at least five signal values from 0 to 100 percent of the meaningful process values, and adjustments shall be made as required.

H. All instruments used for control functions shall be tested with the final elements in the circuit in addition to simulated control methods. The Contractor shall adjust instruments and/or final elements to obtain the best working conditions for a dynamic system. The Specifications and Drawings show the general intent of the work only and not all system components are specified. The Contractor shall provide all materials, equipment, and labor needed to provide a complete and operable and code compliant permitted system, and in accordance with manufacturer recommendations. All components of the system shall be explosion proof as needed.

I. Owner shall be responsible for furnishing initial fuel delivery for initial startup and testing. Contractor shall coordinate with Owner at least 1 week in advance of testing and start up to allow time to order fuel.

END OF SECTION 28 40 00

SECTION 31 00 00 - EARTHWORK

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this section of Specifications.

1.2 DESCRIPTION OF WORK:

A. Work Included: Furnish all labor, supervision, equipment, supplies, and materials and perform all operations necessary to complete the work of this Section, including but not limited to the following:

1. Earth and rock excavation of all types.
2. Sheeting, shoring and dewatering of excavations and trenches.
3. Excavation and backfill for removal, relocation, and abandonment of existing underground utilities, foundations, and below-grade structures.
4. Removal of unsuitable materials below proposed buildings, retaining walls, pavement and sidewalks.
5. Providing, processing, placing, and compacting earth and rock fill materials.
6. Removal, hauling, stockpiling, re-handling, and placement of materials.
7. Off-site disposal of excess or unsuitable materials.
8. Rough grading.
9. Prepare subgrades for structures, foundations, pipes, appurtenances, paved areas, and sidewalks.

B. Site-Specific Issues:

1. Completed explorations indicate subsurface conditions at specific locations only and only to the depths penetrated. They do not reflect subsurface conditions and bedrock elevations present between exploration locations. Variation of subsurface conditions should be anticipated.
2. Existing fill, construction and demolition debris, and cobbles/boulders were encountered in subsurface explorations completed at the site and should be expected within required excavation depths for site grading, foundations, utilities, and other site improvements. These materials are not suitable for support of foundations, slabs, and other rigid site improvements and shall be removed and

replaced with compacted Structural Fill.

3. Subgrade protection is the responsibility of the contractor and special precautions and protective measures appropriate for the weather conditions during construction shall be used during earthwork and foundation construction to preserve the integrity of subgrades. Disturbed subgrades shall be repaired at the sole expense of the Contractor.

C. Geotechnical Field and Laboratory Testing:

1. The Owner will retain the services of a geotechnical testing laboratory to conduct the laboratory analyses and field testing of soil materials required by this specification. Coordinate locations and types of field tests to be performed with the Engineer and cooperate in every way with the Engineer and testing laboratory during field testing and with collection of soil samples for laboratory testing.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 00 31 33, ENVIRONMENTAL SUBSURFACE DATA
2. Section 01 11 00, CONTROL OF WORK AND MATERIALS
3. Section 31 05 19.13, GEOTEXTILE FABRICS
4. Section 31 11 00, CLEARING AND GRUBBING
5. Section 31 25 00, EROSION AND SEDIMENT CONTROL
6. Section 31 23 19, DEWATERING
7. Section 31 50 00, SUPPORT OF EXCAVATION
8. Section 32 12 00, PAVING
9. Section 32 32 23.13, SEGMENTAL RETAINING WALL SYSTEM

1.4 REFERENCES:

ASTM International (ASTM)

ASTM	C131	Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
ASTM	C330	Specification for Lightweight Aggregate for Structural Concrete.

ASTM	D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3))
ASTM	D6938	Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM	D6913	Standard Test Method Particle Size Analysis of Soils

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

Code of Massachusetts Regulations (CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.5 SUBMITTALS AND TESTING:

Submit the following in accordance Section 01 33 23, SUBMITTALS.

A. Backfill Materials:

a. Submit a 50-pound sample for each backfill material from each proposed source including on-site materials. Samples of off-site soil borrow for submission shall be collected in the presence of the Engineer so that the Engineer has the opportunity to see each borrow material at the source. Additional samples shall be taken for materials delivered to the site.

b. Submit a grain size distribution curve performed in accordance with ASTM D6913 and results of a moisture-density relationship determination in accordance with ASTM D1557 for each proposed backfill material and for those delivered to the site for review by the Engineer. Additional samples and analysis shall be submitted if a change in material occurs at the borrow source.

c. A certification statement and analytical results shall accompany each physical sample of earth materials to be imported onto the site, including but not limited to crushed stone, loam, bedding sand, gravel sub-base, common borrow and structural fill. At a minimum the certification shall state the point of origin and that the material is free of contaminants. The certification shall include representative sample analysis from each point of origin of backfill to be used on the site. The sample(s) shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082).

d. All sampling of soils for chemical testing shall be performed by a person experienced in sample collection and shall be either: 1) a Licensed Site Professional registered in the Commonwealth of Massachusetts; 2) a Professional Engineer registered in the Commonwealth of Massachusetts; or 3) an authorized representative of the one of the persons listed above. Samples of each material shall be submitted to a chemical analytical laboratory, certified by the Massachusetts Department of Environmental Protection.

e. Submit additional geotechnical and analytical test data and certifications for every 1000 cubic yards (every 500 cubic yards for moisture density curves) of material imported or reused on-site or anytime consistency of material changes in the opinion of the Engineer. Submit associated chemical laboratory data on the imported materials throughout the course of the Work, if requested by the Engineer, to evaluate the consistency of the source or process, at no additional cost to the Owner.

B. Within one week after making field adjustments, resubmit revised working drawings as necessary to reflect changes required by field conditions.

1.6 EXAMINATION OF SITE AND DOCUMENTS

A. The Contractor shall carefully examine the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation of the site.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for themself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

1.7 DEFINITIONS

A. Backfill and Fill Materials: Soil and rock material used in construction as specified herein.

B. Structures: Buildings, concrete slabs, foundations, equipment pads, manholes, below grade vaults and equipment capsules.

C. Unsuitable Material: Include topsoil, existing undocumented fill, material containing organic silt, organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inches in diameter, porous biodegradable matter, disturbed soils, debris, contaminated media, snow, ice or refuse. Unsuitable material also includes any materials not suitable for reuse as backfill as defined by the requirements of this Specification.

D. Subgrade: the bottom surface of a trench or excavation extending to the underside of site improvements, including bedding materials for building foundations and slabs, structures, pavement subbase, or other surfacing material.

E. Pass: a single complete coverage with compaction equipment over the entire surface of an exposed lift or subgrade being compacted.

F. Zone-of-Influence: Defined by a horizontal plane extending away from the outside bottom edge of the footings, slabs, structures, and utilities a distance of two feet, then by a plane that slopes down and away from the foundation at a maximum 1H:1V slope to the natural inorganic soil subgrade.

1.8 EXCAVATION CLASSIFICATIONS

A. Earth Excavation or "Excavation" consists of removing materials encountered to the subgrade elevations indicated and subsequent reuse or disposal of the materials removed. All excavation is classified as earth excavation unless it otherwise meets the classifications provided below for unauthorized excavation, additional excavation, or rock excavation.

B. Unauthorized Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions that is not specifically required by the Engineer. Unauthorized excavation, as well as remedial work required by the Engineer, shall be at the Contractor's expense.

   1. Under footings, foundations, concrete slabs, retaining walls or other structures, fill unauthorized excavations to the proper elevations with Structural Fill as defined herein or as required by the ground improvement designer. Elsewhere, backfill and compact unauthorized excavations as specified for excavations of the same class, unless otherwise required.

C. Additional Excavation:

   1. When excavation has reached required subgrade elevations, notify the Engineer, who will observe subgrade conditions.

   2. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and to the lateral extent as required by the Engineer. Replace excavated material with suitable backfill as specified in this section or the ground improvement designer.

   3. Removal of unsuitable material and its replacement as specified is included in the base Scope of Work and shall be included in the lump sum price. The Contractor shall promptly notify the Owner and the Engineer if unsuitable material quantities represent, in the Contractor’s opinion, a differing subsurface or physical condition. Any corresponding adjustment to the Contract Price and/or Contract Terms shall be made in accordance with the Contract Documents.

D. Rock Excavation:

   1. Rock excavation in trenches and footing excavations includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42-inch wide bucket on medium-size track-mounted hydraulic excavator equivalent to Caterpillar Model 215, rated at not less than 90HP flywheel power and 30,000 lb. drawbar pull. Trenches and footing excavations in

excess of 10-feet in width are classified as open excavation.

2. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty hydraulic excavating equipment without drilling or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170 HP flywheel power and developing 40,000-lb. breakout force (measured in accordance with SAE J732C).

3. Determination of rock excavation classification will be made by the Engineer. Typical materials classified as rock are boulders 3.0 cubic yards or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by the Engineer. Visual observation of the completed excavation may be made by the Engineer to modify the excavation classifications. Removal of rock excavation prior to classification by the Engineer shall be considered as earth excavation unless accepted by the Engineer in writing. Such excavation will be paid on the basis of contract unit rates for this classification.

4. Rock payment lines (if applicable) are limited to the following:

   a. Two feet outside of concrete work for which forms are required.

   b. In footing excavations, one foot below bottom-of-footing elevation.

   c. One foot below bottom-of-slab elevation.

   d. One foot outside of the vertical walls of utility structures.

   e. In pipe trenches, depth limits shall be 6 inches below the bottom of the pipe:

Depth from Ground Surface to Invert of Pipe	Pay Width (Pipe ID)	
	0 - 24”	Over 24”
0 to 12’	5’-0”	Pipe I.D. +3’-0”
12’ to 20’	7’-0”	Pipe I.D. +7’-0”
Over 20’	9’-0”	Pipe I.D. +7’-0”

   f. Rock sloping across the width of trench shall have the top of rock established at the rock elevation over the centerline of the pipe.

   g. For all other site improvements not listed above, including but not limited to landscape plantings, and roadways, the payment line for rock removal shall be the subgrade for installation of the earthen components of the particular site improvement.

1.9 PERMITS, CODES, AND SAFETY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of the municipality, the Commonwealth of Massachusetts, and other authorities having jurisdiction over the project site or work. All labor, materials, equipment and services necessary to make the work comply with these requirements shall be provided by the Contractor without additional cost to the Owner.

B. Comply with the provisions of the Manual for Accident Prevention in Construction of the Associated General Contractors of America, Inc., and the requirements of the Occupational Safety and Health Administration, United States Department of Labor.

C. The Contractor shall obtain and pay for all permits and licenses required to the complete work specified herein and shown on the Contract Drawings.

D. The Contractor shall not close or obstruct any street, sidewalk, or passageway without written permission from authorities having jurisdiction unless otherwise indicated on the Contract Drawings. The Contractor shall conduct his operations as to minimize interference with the use of roads, driveways, or other facilities near enough to the work to be affected by the work.

E. The Contractor shall notify “Dig Safe” at 1-888-DIG-SAFE prior to commencing any excavation work.

F. The Contractor shall provide police details when working in roadways as required by local jurisdictional authorities. The Contractor shall pay for any and all details.

1.10 PROTECTION OF EXISTING PROPERTY:

A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, benchmarks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.

B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at its own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.

C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment and shall be maintained at all times until completion of project.

1.11 DRAINAGE:

A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.12 FROST PROTECTION AND SNOW REMOVAL:

A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.

B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS:

A. COMMON BORROW:

Common Borrow shall be well-graded, natural inorganic soil containing no stone greater than 6-inches maximum dimension and possess no more than 30 percent of material by weight passing the No. 200 sieve. The materials shall be free of trash, ice, snow, tree stumps, roots and other organic and deleterious materials. It shall be free of plastic clays, of all materials subject to decay or other materials that will corrode piping or metals. Common Borrow shall have a maximum dry density of not less than 110 pounds per cubic foot. It shall be of such a nature and character that it can be compacted to the specified densities. Topsoil shall not be considered Common Borrow.

B. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.03.0, Type b.

C. DENSE GRADED CRUSHED STONE:

Dense graded crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.7.

D. STRUCTURAL FILL:

Structural Fill shall satisfy the requirements of Gravel borrow or Dense Graded Crushed Stone, above.

E. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.4 (3/4-inch crushed stone) unless otherwise required.

F. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

G. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	-	100%
Passing No. 8 sieve opening	-	0%

H. Existing available soil materials from on-site excavations may be reused as Common Borrow or for Structural Fill provided the on-site materials meet the material requirements as described above.

G. GEOTEXTILE FABRIC:

Geotextile fabric used for drainage and separation shall consist of a non-woven fabric made from polypropylene or polyethylene filaments or yarns. The fabric shall be inert to organic chemicals commonly encountered in the soil. The fabric shall conform to the following recommended property tests:

Property	**Unit**	**Test Method**	**Minimum Value**
Weight	oz/sy	ASTM D-5261	8.0
Grab Strength	lbs	ASTM D-4632	205
Grab Elongation	percent	ASTM D-4632	50
Trapezoid Tear Strength	lbs	ASTM D-4533	80
Mullen Burst Strength	psi	ASTM D-3786	350
CBR Puncture Strength	lbs	ASTM D-6241	500
Apparent Opening Size (AOS)	U.S. std. Size Sieve	ASTM D-4751	80

Edges of filter fabric shall overlap a minimum of one foot.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Contract Drawings indicate the proposed finish alignments, elevations, and grades of the work. Establish the line and grade in close conformity with the Contract Drawings. The Engineer, however, may make minor adjustments in the field as necessary due to conditions encountered.

B. The Contractor is responsible for establishing construction phasing, means, and methods and interim grading and temporary conditions required to attain the finished product required by the Contract Documents. The Contractor is responsible for all construction, protection, movement, and maintenance of stockpiles. Establish and maintain suitable benchmarks and grade control to accurately perform the work.

C. Perform all excavations and of whatever materials encountered, in a manner as required to allow for placing of temporary earth support, forms, installation of pipe and other work, and to permit access for the purpose of observing the work. Excavations shall be to such widths as will give suitable space for the required work.

D. No excavation is permitted below a line drawn downwards at 2 horizontal to 1 vertical from the underside of the closest edge of any in-place footing, slab, or utility at a higher elevation without providing adequate sheeting and bracing (designed by a Professional Engineer in Massachusetts and retained by the Contractor) to prevent movement of the in-place footing, slab, or utility.

E. In no case shall earth be excavated or disturbed by machinery so near to the finished subgrade for structures and pipelines as to result in the disturbance of the earth below the subgrade. The final excavation to subgrade should be accomplished with a smooth bladed bucket or by hand.

F. When excavations have reached subgrade elevations, the condition of the bottom of the subgrade shall be observed and evaluated by the Engineer prior to placement of overlying materials including fill, crushed stone, concrete forms, rebar, and pavements. Evaluation may consist of probing and/or visual observation of a proof roll using the rear wheels of a fully loaded 10-whell dump truck or construction equipment of similar size, weight, and configuration. The Contractor shall provide all necessary equipment and personnel for proof rolling. After observation and evaluation, the Contractor will receive approval to proceed if conditions meet project requirements.

G. Unless suitably improved by ground improvement, all fill, debris, organics, and other deleterious materials shall be removed from within the zone-of-influence beneath new footings, slabs, and other structural improvements to expose the native, inorganic soils unless otherwise required.

H. Existing fill can remain below proposed pavement areas; however, any debris or organic materials present at subgrade elevations shall be removed to expose inorganic granular fill or native inorganic native soils. Subgrades in pavement areas should be prepared as required by this section and Section 32 12 00, PAVING.

I. Subgrades shall be recompacted prior to placing overlying materials until dense and stable. Subgrades not improved by Ground Improvement shall be recompacted with several passes of a minimum 10-ton vibratory roller or equivalent effort. Areas with limited access shall be recompacted with at least four passes of a 700-pound vibratory plate compactor or equivalent effort. Subgrades in areas improved with ground improvement shall be recompacted as required by the ground improvement designer.

J. Subgrades and bottoms of trenches and excavations shall be protected from frost and shall be firm, dry and in an acceptable condition to receive the work. Work shall not be placed on frozen surfaces nor shall work be placed on wet or unstable surfaces.

K. No excavated material shall be deposited or stockpiled at any time to endanger portions of new or existing structures or slopes, either by direct pressure or indirectly by overloading areas contiguous to the operation. Material, if stockpiled, shall be stored so as not to interfere with the established sequence of the construction. If there is not sufficient area available for stockpiling within the limits of the project, the Contractor will be required to furnish their own area for stockpiling.

L. When the plans require excavation in areas in close proximity to existing buildings, roads, structures and utilities it shall be the responsibility of the Contractor at their expense to use satisfactory means and methods to protect and maintain the stability of such roads, and structures.

M. Temporary ditches shall be made as needed to drain off surface water to avoid damaged to areas of cut or fill. Such ditches shall be maintained as required for efficient operations, at no additional cost to the Owner.

N. The Contractor shall segregate and stockpile separately materials that are considered suitable for on-site re-use by the Engineer from unsuitable materials and materials requiring off-site disposal. Costs associated with off-site disposal of materials that are considered suitable for re-use by the Engineer, whether mixed with unsuitable materials or not, shall be borne by the Contractor.

O. The Contractor shall protect (i.e., cover) all stockpiled material intended for use on-site, imported or suitably excavated, from precipitation. Stockpiled materials that become too saturated to be placed and compacted as required in this Section shall be disposed off-site and replaced with suitable material at no expense to the Owner.

P. The Contractor shall provide shoring, sheeting, and/or bracing at excavations, as required by Section 31 50 00, EXCAVATION SUPPORT to prevent collapse of earth at the side of excavations. Provide shoring of public utility lines where exposed in the excavations in accordance with rules and regulations of the local authorities, at no additional cost to the Owner.

Q. The Contractor shall satisfy all dewatering requirements specified in Section 31 23 19, DEWATERING, before performing any excavations. All excavations shall be performed in the dry. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of the subgrade soils.

R. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric or as required by the ground improvement designer. Costs of removal and replacement shall be borne by the Contractor.

S. The Contractor shall place a minimum of 12-inch layer of crushed stone wrapped in non-woven filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

T. Crushed stone for pipe and structure bedding shall be wrapped in geotextile fabric where placed below the groundwater table or as otherwise required by the Engineer.

3.2 FILLING AND BACKFILLING

A. Subgrade Preparation: The subgrades for buildings, pavement areas, and other site improvements shall be shaped to lines, grades, and cross-sections shown on the Contract Drawings and observed by the Engineer as described in Paragraph 3.01 F. These operations shall include any required reshaping and moisture conditioning to obtain proper re-compaction of loose granular materials. All soft or otherwise unsuitable material shall be removed and replaced with suitable material from excavation or borrow. The resulting area, and all other low sections, holes, or depressions shall be brought to the required grade with accepted material and the entire subgrade shaped to line, grade and cross-section and thoroughly compacted.

1. Before surface or base materials are spread, the subgrade shall be shaped to an accurate and true surface conforming to the line and grades indicated on the Contract Drawings and described above. All surface irregularities shall be filled with suitable material or removed and such areas recompacted until the surface is properly shaped and properly compacted. A tolerance of 3/8- inch in paved areas and 1/2-inch in non-paved areas above or below the finished subgrade elevation will be allowed provided that this dimension above or below grade is not maintained for a distance longer than 50-feet and that the required crown is maintained in the subgrade. Any portion, which is not accessible to a roller, shall be thoroughly compacted by other mechanical or manual methods.

B. Use of processed and recycled demolition materials as specified in Section 2.01 as fill and backfill is limited to areas outside structures, outside the ‘zone of influence’ below foundation elements (as defined above), and at grades greater than 1 foot below finished subgrade elevations in pavements and landscaped areas. Such materials shall be placed in maximum 10-inch thick lifts measured prior to compaction. Each lift shall be thoroughly compacted to at least 95 percent of the maximum dry density as determined by Modified Proctor Compaction Testing (ASTM D1557).

C. Refer to Section 31 66 13, GROUND IMPROVEMENT for additional requirements for subgrade preparation over ground improvement elements.

D. Backfill Material: Unless otherwise specified or required, material used for filling and backfilling shall meet the material requirements specified herein.

1. Common Borrow for all unpaved areas around the site, and at depths greater than three feet below finished grade for proposed pavements or sidewalks.
2. Structural Fill within three feet of finished grade below proposed pavements or sidewalks.
3. Structural Fill within the zone-of-influence of footings, slabs, and equipment pads unless otherwise specified.
4. Controlled Density Fill shall be used in areas where the required degree of compaction cannot be achieved using conventional earth materials and compaction equipment, such as around structures and support of excavation systems, to fill abandoned utilities, or as required by the Engineer.
5. In areas where the bottom of the excavation is in fine sand and silt, and is below the groundwater table, crushed stone may be placed and compacted in maximum 12-inch layers to provide a working mat and drainage layer. The crushed stone shall be separated on the top and all sides from adjacent material by geotextile fabric as specified herein.

E. Fill Placement:

1. All fill shall be placed in horizontal layers. Fill shall not be placed following the natural contours of the ground. Fill shall be placed starting in the lowest areas working up to finish grades in horizontal layers in the manner specified herein. Each layer of fill shall be benched into the existing slope in order to avoid the formation of a shear plane.

2. Unless otherwise specified, place backfill materials in a maximum loose lift thickness of 10-inches. Maintain backfill material with uniform moisture content, with no visible wet or dry streaking, and at a moisture content that allows compaction to the degree specified herein. Maximum lift thickness shall be 6-inches (loose thickness) where hand operated compaction equipment is used.

F. Unfavorable Conditions:

1. In no case shall fill be placed over material that is frozen. In no case shall frozen soil or soil material containing frost, snow or ice be placed as backfill. No fill

material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

2. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth wheeled roller to eliminate ridges of soil left by compaction equipment.

G. Trench Backfill:

1. After the utility pipe installation has been inspected and approved, trenches shall be backfilled as soon as practicable with specified material. All trench backfilling shall be done with care.

2. Backfill material for pipe bedding shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench to the springline of the pipe. The backfill material shall be placed by hand shovels, in layers not more than 6-inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids.

3. The balance of backfill shall be spread in layers not exceeding 9-inches in loose depth. Each layer shall be thoroughly compacted by mechanical methods and shall contain no rock, stones or boulders larger than 4 inches in their greatest dimension.

4. All trench backfilling shall be done with special care and must be carefully placed so as not to disturb the work at any time; if necessary, a timber grillage or other suitable method shall be used to break the fall of the material. The moisture content of the backfill material shall be such that proper compaction will be obtained. Puddling of backfill with water will not be permitted. Backfill within areas to receive topsoil or pavement construction shall be made to grades required to establish the proper subgrade for the placement of topsoil or pavement base courses.

5. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density at least equal to that of the surrounding undisturbed earth, and in such a manner as to permit the rolling and compaction of the filled trench or excavation with the adjoining earth to provide the required bearing value, so that paving of the excavated and disturbed areas, where required, can proceed immediately after backfilling is completed.

6. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.

7. During filling and backfilling operations, pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the observation of the pipelines shows poor alignment, displaced pipe or any other defects they shall be remedied in a manner satisfactory to the Engineer at no additional cost to

the Owner.

H. Backfilling Against Structures:

1. Backfilling against masonry or concrete shall not be done until permitted by the Engineer. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed and approved, special leakage tests of the structures shall be made by the Contractor, as required by the Engineer. After satisfactory completion of leakage tests and satisfactory completion of any other required work in connection with the structures, backfilling around the structures shall commence using suitable and approved excavation material. Just prior to placing backfill, the areas shall be cleaned of all excess construction material and debris and the bottom of excavations shall be in a thoroughly compacted condition. In general, use Structural Fill for backfilling against structures where the finished ground surface will be pavement or sidewalks; use Common Borrow where the finished ground surface will be lawn or landscaped areas.

2. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures. During backfilling operations, care shall be exercised that the equipment used will not overload the structures in passing over and compacting these fills. Except as otherwise specified or directed, backfill shall be placed in layers not more than 9-inches in loose depth and each layer of backfill shall be compacted thoroughly and evenly using approved types of mechanical equipment. Each pass of the equipment shall cover the entire area of each layer of backfill.

3. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be made good by the Contractor at no additional expense to the Owner.

I. After backfilling trenches and excavations, the Contractor shall maintain the surfaces of backfill areas in good condition so as to present a smooth surface at all times level with adjacent surfaces. Any subsequent settling over backfilled areas shall be repaired by the Contractor immediately, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to the Owner.

J. The completed and approved subgrades upon which topsoil is to be placed, or pavements are to be installed, shall not be disturbed by traffic of other operations and shall be maintained in a satisfactory condition until the base and finished courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.

K. Uniformly shape the surfaces of all areas to be graded, to the lines and grades indicated on the Contract Drawings, and as directed, including excavated and filled sections, embankments and adjacent transition areas, and all areas disturbed as a result of the

Contractor's operations. The finished surfaces shall be reasonably smooth, compacted and free from surface irregularities.

L. The Contractor is responsible to provide the finish grades as shown on the Contract Drawings. The Contractor shall provide temporary erosion control throughout the construction period to maintain all constructed lawns, and to protect all existing drains, catch basins, swales, from any debris or soil entering from excavation, backfill, or erosion. Contractor shall take whatever precautions are necessary to accomplish this temporary erosion control such as straw bales, silt fence, erosion control fabric, or pumping, at no additional cost to the Owner.

3.03 COMPACTION

A. Compaction Requirements: The degree of compaction is expressed as a percentage of the maximum dry density of the material at optimum moisture content as determined by ASTM Test D 1557, Method C. The compaction requirements are as follows:

Area	**ASTM Density Degree of Compaction**
In the zone of influence below foundations, slabs, retaining walls, and other structural features	95%
Pavement base course	95%
Pavement subgrade	95%
General fill below pavement subbase	95%
Trench backfill - below pavements	95%
- below landscaped areas	92%
- below structures	95%
All other areas	92%

Crushed stone, where used, shall be compacted by multiple passes of a vibratory plate compactor or drum roller to a firm and unyielding condition as satisfactory to the Engineer. Adequate compaction of crushed stone shall be evaluated by the Engineer by visual observation, probing, and or proof rolling.

B. Moisture Control:

1. Fill that is too wet for proper compaction shall be disced, harrowed, or otherwise mixed and dried to a proper moisture content to allow compaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill.

2. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

C. Compaction Control:

1. In-place density tests shall be made in accordance with D2922 as the work progresses, to evaluate the degree of compaction being attained by the Contractor. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to the Owner. Additional in-place density

testing shall be made at the Contractor's expense by the geotechnical testing laboratory. Testing locations shall be selected by the Engineer unless otherwise noted.

2. In-place density tests shall be performed at a minimum according to the following:
    a. One test per lift for each 5,000 square feet of building area fill.
    b. A minimum of one test per lift for each 100 linear feet of trench.
    c. One test per lift for each 10,000 square feet of pavement and sidewalk subgrade fill area.
    d. One test per lift for each 100 linear feet of roadway fills.
    e. One test per lift for each 100 linear feet of embankments.

3.03 DISPOSAL OF SURPLUS MATERIALS:

A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.

B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by it. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.

C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.

D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not be disposed of at locations where concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and /or hazardous materials present in the soil being disposed or reused.

END OF SECTION 31 00 00

SECTION 31 05 13.22- CONTROLLED DENSITY FILL (CDF)

PART 1 - GENERAL

1.1 DESCRIPTION:

Controlled Density Fill (CDF) is a flowable, self-consolidating, rigid setting, mixture of aggregate and cementitious material containing sufficient portland cement to:

A. Develop a 28-day compressive strength of between 75 to 150 psi.
  - CDF can be used for backfills, fills, and structural fills.

B. There are two main categories of Controlled Density Fill; excavatable and non-excavatable, each with a subcategory of flowable and very flowable.

C. Controlled Density Fill is to be used where indicated on the contract drawings or as required by the Engineer.

1.2 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 11 00, CONTROL OF WORK AND MATERIALS

C. Section 01 22 00, MEASUREMENT AND PAYMENT

D. Section 01 33 00, SUBMITTAL PROCEDURES

E. Sections 31 00 00, EARTHWORK

F. Section 31 50 00, SUPPORT OF EXCAVATION

G. Section 32 12 00, PAVING

1.3 REFERENCES:

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges - Subsection M4.08.0, CONTROLLED DENSITY FILL.

1.4 SUBMITTALS:

Proposed Mix Designs for the type(s) of Controlled Density Fill shall be submitted for review and approval from the Contractor’s Ready Mix provider in accordance with Section 01 33 23.

PART 2 - PRODUCTS

2.1 MATERIALS:

Materials employed in the Controlled Density Fill shall meet the requirements as described in MassDOT Standard Specifications Subsection M4.08.0.

2.2 TYPE OF CONTROLLED DENSITY FILL:

A. Type: Controlled Density Fill for this project shall be (Type 1 - Very Flowable (Non-excavatable), Type 1E - Very Flowable (Excavatable), Type 2 - Flowable (Non-excavatable) or Type 2E - Flowable (Excavatable), as described in MassDOT Subsection M4.08.0, or as required by the Engineer.

B. Strength: Controlled Density Fill shall have a 28-day compressive strength of between 75 to 150 psi, or as required by the Engineer.

PART 3 - EXECUTION

3.1 GENERAL:

A. Controlled Density Fill shall be batched at a ready mix plant and is to be used at a high or very high slump of approximately 10- to 12-inches. It shall be flowable, require no vibration and after it has been placed for Type 1E and 2E, be excavatable by hand tools and/or small machines.

B. Controlled Density Fill shall be placed so as to not disturb adjacent structures, utilities or the sidewalls of trenches.

C. Controlled Density Fill shall be installed to the limits shown on the drawings, or as required by the Engineer.

D. The Controlled Density Fill shall be protected until it reaches sufficient strength.

END OF SECTION 31 05 13.22

SECTION 31 05 19.13 - GEOTEXTILE FABRICS

PART 1 - GENERAL

1.1 WORK INCLUDED:

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as required by the Engineer.

1.2 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings or working drawings and material specifications shall be submitted to the Engineer for review for each type of geotextile fabric furnished. General installation practices and installation schedule shall be included.

PART 2 - PRODUCTS

2.1 FILTER/DRAINAGE FABRIC:

A. The filter/drainage fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Tencate Mirafi 180N.

B. The filter/drainage fabric shall be Tencate Mirafi 180N as manufactured by Tencate Geosynthetics, Pendergrass, GA; Foss-65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.

2.2 IMPERMEABLE GEOMEMBRANE LINER:

A. The geomembrane liner protector shall be PVC, and shall be a minimum 20-mils thick.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. GENERAL:

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Engineer.

B. FILTER/DRAINAGE FABRIC:

1. The filter/drainage fabric shall be installed in the final graded trench bottom prior to placement of the crushed stone bedding and at other locations shown on the drawings or designated by the Engineer. The drainage fabric in place shall cover the entire trench bottom and trench sides as shown on the drawings. Each width of drainage fabric shall be overlapped in accordance with manufacturer’s recommendations, but not less than 2 feet, to prevent intrusion of soil fines into the bedding.

2. On landfill projects, the filter/drainage fabric shall be installed over the drainage layer prior to loaming and seeding, per manufacturer’s installation recommendations.

C. IMPERMEABLE GEOMEMBRANE LINER:

The geomembrane liner protector shall be installed in the final graded trench bottom of bioretention swale prior to placement of drainage stone and bioretention media . The geomembrane liner shall cover the bottom and sies of the bioretention swale as shown on the drawings. The installation shall be strictly in accordance with manufacturer's recommendations.

3.2 FINAL INSPECTION AND ACCEPTANCE:

A. The Contractor shall, at its expense, have a manufacturer's representative inspect the work at completion of the installation. Any work found to be unsatisfactory shall be corrected at the Contractor's expense.

B. The Engineer, at the Contractor's expense, reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

END OF SECTION 31 05 19

SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. The Contractor shall do all required clearing and grubbing as indicated on the drawings or herein specified in the area required for construction operations on the Owner's land or in the Owner's permanent or temporary easements and shall remove all debris resulting therefrom.

B. Unless otherwise noted, all areas to be cleared shall also be grubbed.

C. The Contractor shall not clear and grub outside of the area required for construction operations.

1.2 RELATED WORK:

Any trees and shrubs specifically designated by the Owner not to be cut, removed, destroyed, or trimmed shall be saved from harm and injury in accordance with Section 01 57 19, ENVIRONMENTAL PROTECTION.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.1 RIGHT TO WOOD AND LOGS:

The Owner shall have the right to cut and remove logs and other wood of value in advance of the Contractor's operations. All remaining logs and other wood to be removed in the course of clearing shall become the property of the Contractor.

3.2 CLEARING:

A. Unless otherwise indicated, the Contractor shall cut or otherwise remove all trees, saplings, brush and vines, windfalls, logs and trees lying on the ground, dead trees and stubs more than 1-foot high above the ground surface (but not their stumps), trees which have been partially uprooted by natural or other causes (including their stumps), and other vegetation matter such as shags, sawdust, bark, refuse, and similar materials.

B. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground as practicable but not more than 6-inches above the ground surface in the case of small trees, and 12-inches in the case of large trees. Saplings, brush and vines shall be cut close to the ground.

3.3 GRUBBING:

A. Unless otherwise indicated, the Contractor shall completely remove all stumps and roots in their entirety. The stumps and roots shall be removed by mechanical means. No stump grinding is acceptable.

B. Any depression remaining from the removal of a stump and not filled in by backfilling shall be filled with gravel borrow and/or loam, whichever is appropriate to the proposed ground surface.

3.4 DISPOSAL:

All material collected in the course of the clearing and grubbing, which is not to remain, shall be disposed of in a satisfactory manner away from the site or as otherwise approved. Such disposal shall be carried on as promptly as possible and shall not be left until the final clean-up period.

END OF SECTION 31 11 00

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 WORK INCLUDED:

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; on-Site treatment and recharge of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

1.2 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 57 19, ENVIRONMENTAL PROTECTION

C. Section 31 00 00, EARTHWORK

1.3 SYSTEM DESCRIPTION:

A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and treatment and on-Site recharge of pumped water.

B. The Contractor shall treat dewatering fluids, including where present to remove sheens, prior to discharge to the ground for recharge. The Contractor shall treat all dewatering fluids prior to on-site recharge. The Contractor shall be aware that elevated groundwater may require the Contractor to store on-site and dissipate treated dewatering fluids to ground surface at no additional cost to the Owner. No treated or untreated dewatering fluids may be discharged to on-site catch basins or to the impervious ground draining into area surface water bodies.

C. Normal dewatering is defined as using conventional pumps installed in open excavations, ditches, or sumps. Special dewatering is defined as using single or two stage wellpoints, deep wells, or eductor and ejector systems installed in drilled holes or jetted in place.

1.4 QUALITY ASSURANCE:

A. The Contractor is responsible for the adequacy of the dewatering systems. He/she shall retain the services of a Professional Engineer registered in the state where the project is located, experienced in dewatering systems, to independently evaluate the boring logs and any other soils information available to determine those areas that will require special dewatering techniques and to design the required system. The Contractor's Professional Engineer shall provide sufficient on-site inspection and supervision to assure that the dewatering is carried out in accordance with his/her design.

B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise required by the Engineer, so that all excavation bottoms are firm and dry.

C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.

D. The dewatering system and excavation support (see Section 31 50 00) shall be designed so that lowering of the groundwater level within the work area does not adversely affect structures, utilities or wells outside of the work area.

E. Where special dewatering is used, the Contractor shall obtain at his/her expense the services of a registered professional engineer to investigate, design and monitor the dewatering system. The Contractor shall also furnish materials and install at least two observation wells at each excavation area. The location of the wells shall be determined in the field by the Contractor’s engineer.

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. At least two weeks prior to installing his/her dewatering system, Contractor shall submit the attached Certificate of Design completed and signed by Contractor, identifying the engineer responsible for design of the dewatering system. He/she shall also submit a schedule showing the timing of installation and operation of the dewatering system.

This submittal shall include a Dewatering Plan indicating how dewatering fluids will be controlled and treated prior to on-Site recharge from any dewatering operations on the project, whether it is groundwater from excavations or stormwater runoff during the life of the project. The Dewatering Plan shall include a description of treatment of dewatering fluids with petroleum sheens for on-Site recharge post-treatment. Petroleum sheen treatments may include absorbent booms with a replacement schedule, organoclay barriers within a geotextile mat, and/or approved equal treatment proven effective at removing sheens on-site. Dewatering fluid storage shall also be included in the submittal including a frac tank with a minimum 20,000-gallon capacity.

B. The Contractor shall submit to the Engineer for record purposes only, the following items bearing the Contractor's Engineer's stamp and signature, and identifying the codes and specifications followed in the design.

1. Plans and description of the dewatering system, including the number, location and depth of wells, wellpoints or sumps; designs of filters to prevent pumping of fine soil; method and location for filtering, treatment and on-Site recharge of pumped water; and flow capacity of proposed system.

2. Locations of observation wells.

C. The Contractor shall submit records of pump operation and groundwater elevations as required by the Owner's Engineer.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.1 DEWATERING OPERATIONS:

A. All water pumped or drained from the work shall be treated and recharged on-site in a manner which will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. The Contractor shall provide suitable temporary pipes, flumes or channels for water that may flow along or across the site of the work. All treatment of pumped water shall conform to the provisions of Section 01 57 19 ENVIRONMENTAL PROTECTION and Section 00 31 43 PERMITS.

B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.

C. Project dewatering procedures shall be described by in the Contractor’s Dewatering Plan.

D. The Contractor shall be responsible for repair of any damage caused by his/her dewatering operations, at no cost to the Owner.

E. The Contractor shall treat dewatering fluids including dewatering fluids with sheens on-Site at no additional cost to Owner. With the approval of the Engineer, the treated dewatering fluids once free of sheen may be recharged to the subsurface on-Site. Discharges to the stormwater system and/or wetland are not allowed, unless permitted and with the approval of the Owner and the Engineer.

F. Treated dewatering fluids shall be recharged upgradient within 100 feet of the point of generation unless an alternative discharge location is approved by the Engineer in advance of recharge.

3.2 SPECIAL DEWATERING:

A. If conventional dewatering methods are inadequate to ensure dry and stable conditions for structural foundations, the Contractor shall be required to use special dewatering as necessary.

B. Special dewatering techniques may consist of one or two stage wellpoint systems, deep wells, or eductor and ejector type systems. The Contractor shall utilize a system which provides proper construction conditions and prevents settlement at time of installation and upon backfilling.

C. In areas requiring special dewatering, the Contractor shall lower the groundwater level to a minimum of 2 feet below the bottom of the final excavation grade prior to any installation and maintain that groundwater level until the excavation has been backfilled. The groundwater levels shall be monitored by the Contractor's engineer to ensure conformance with the requirements of these specifications. Construction will not be allowed until the Owner's Engineer is satisfied that the above provisions are met.

3.3 NOISE LEVEL REQUIREMENTS:

A. All primary dewatering equipment shall be electrically operated and shall run on commercial power. Standby equipment shall be independent of commercial power and shall provide dewatering upon primary pump or power failure.

B. All equipment utilized by the Contractor shall conform to the Department of Environmental Protection Division of Air Quality Control regulations governed by the following policy:

"A source of sound will be considered to be violating the Department's noise regulation (310 CMR 7.10) if the source:

1. Increases the broadband sound level by more than 10 dB(A) above ambient, or

2. Produces a "pure tone" condition - when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment operating hours. The ambient may also be established by other means with the consent of the Department."

The Contractor shall construct sound enclosures or utilize other noise reduction techniques if the equipment does not meet the noise level requirements.

END OF SECTION

(Certificate of Design follows this page)

CERTIFICATE OF DESIGN

Re: Contract Between:

OWNER: ____
(Name)
and
CONTRACTOR: ____
(Name)
on
CONTRACT: ____
(Number)

Date: ______________________________________

Title: ______________________________________

Contractor hereby certifies that ________________:
(Engineer)

1. Is licensed or registered to perform professional engineering work in the state of ______________________;
(Location of Project)

2. Is qualified to design the ______________________________
(Item)
specified in Section _______ of subject contract;

3. Has designed ______________________________ before;
(Item)

4. Has prepared the design in full compliance with the applications and requirements of Section _______ of subject contract including all applicable laws, regulations, rules, and codes; and

5. The work has been signed and sealed pursuant to applicable state law.

FOR: ______________________________
(Contractor)

BY: ______________________________
(Signature)

____
(Name and Title)

Dated: ________________

SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for erosion and sedimentation control work indicated on contract drawings and as specified herein.

1.2 RELATED WORK:

A. Section 01 14 19.16, DUST CONTROL

B. Section 01 57 19, ENVIRONMENTAL PROTECTION

C. Section 31 05 19.13, GEOTEXTILE FABRICS

1.3 PROJECT CONDITIONS:

A. Earthmoving activities in the project area shall be conducted in such a manner as to prevent accelerated erosion and the resulting sedimentation.

B. The Contractor shall implement and maintain erosion and sedimentation control measures as shown on the contract drawings or as required by the Owner or Engineer from the start of construction until provisional acceptance of seeded areas, to effectively prevent accelerated erosion and sedimentation.

1.4 SUBMITTALS IN ACCORDANCE WITH SECTION 01330, SUBMITTALS:

A. The Contractor shall submit to the Engineer certification that the materials used for silt fence and compost filter tubes construction meet the specifications.

1.5 GENERAL METHODOLOGY:

A. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:

1. Topographic features of the Project area.
2. Types, depth, slope and areal extent of the soils.
3. Proposed alteration of the area.

4. Amount of run-off from the Project area and the upgradient watershed areas.

5. Staging of earthmoving activities.

6. Temporary control measures and facilities for use during earthmoving.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Erosion Control Blanket

1. Erosion control fabric shall be double net erosion control blanket produced of 100% agricultural straw with a functional longevity of up to 12 months. The blanket shall be covered on the top and bottom sides with a 100% biodegradable woven natural fiber netting, such as jute netting, with an approximate 0.5 x 1.0 in mesh. The blanket shall be sewn together on 1.5-inch centers with degradable thread.

2. The blanket shall meet Type 2.D specifications requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17.

3. Erosion Control fabric "A" shall be BioNet S150 BN Erosion Control Blanket as manufactured by North American Green; or approved equal.

B. Compost filter tubes shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8" to ¼" diameter. The mesh material will either photo degrade within one year or be made of nylon with a life expectancy of 24 months. The sock shall be filled with a mix of composted leaf mulch, bark mulch and wood chips that have been composted for at least one year. The sock will have a minimum diameter of 12-inches.

C. Silt Fence shall be a woven polypropylene and/or polyester material, which meets or exceeds the minimum average roll values requirements tabulated below:

Fabric Property	Test Method	Fabric Requirement
Tensile strength, lbs	ASTM D-4632 Grab	100 minimum
Elongation at 50% minimum tensile strength	ASTM D-4632 Grab	50% maximum
Permittivity, sec^{-1}	ASTM D-4491	0.1 minimum
Apparent opening size, mm	ASTM D-4751	0.84 maximum
Ultraviolet degradation at 500 hours	ASTM D-4355	minimum 70% strength retained

D. Mulch, if used to protect the hydroseed from erosion, shall consist of cured straw free from primary noxious weed seeds, twigs, debris and rough or woody materials. Mulch shall be free from rot or mold and shall be acceptable to the Engineer or Owner. Alternately, mulch shall be specially processed cellulose homogeneous fiber containing no growth or germination-inhibiting factors. Processed cellulose fiber shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a slurry when sprayed on the ground. The material shall allow homogeneous absorption and percolation of moisture. The manufacturer shall show the air-dry weight content on each package of the cellulose fiber. Mulch shall be utilized on all newly graded subgrade and topsoil areas that cannot be seeded within five (5) days.

PART 3 - EXECUTION

3.1 CONSTRUCTION SEQUENCE:

A. Construction of erosion control measures as depicted on drawings will be completed prior to any site work.

B. Sediment barriers shall be used at locations shown on the drawings. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering stormwater runoff.

C. All temporary erosion control measures will be maintained throughout the course of site construction activities until provisional acceptance of the site vegetation by the Engineer or Owner, at which time the Contractor shall remove all remaining temporary erosion control structures, and properly dispose of accumulated sediment on-site in areas approved by the Owner.

D. The Engineer or Owner may order additional erosion and sediment controls to be installed. The Contractor shall comply with Engineer or Owner's request and immediately install the required controls.

E. The Contractor shall inspect all erosion control measures after any storm event to ensure they are in proper working order.

3.2 CONSTRUCTION METHODS:

A. The compost filter tubes shall be staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground. The base of silt fencing shall be embedded to the depths shown on the contract drawings.

B. On slopes, the Contractor shall provide protection against washouts by an approved method. Any washout, which occurs either in the Contractor's work area or in areas topographically below his work, shall be regraded and reseeded at the Contractor's expense until an accepted vegetative stand is established.

3.3 EROSION CONTROL BLANKT:

A. Erosion control fabric “A” shall be installed on earth slopes of 3:1-2:1 and at drainage swale surface as shown on the drawings or as required by the Engineer. The fabric in place shall cover the entire slope area and be anchored in place at the top of the slope in a 6”D x 6”W trench with approximately 12” of fabric in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12” portion of fabric back over seed and compacted soil. Secure fabric over compacted soil with a row of staples/stakes spaced approximately 12” apart across the width of the fabric . Each width of fabric shall be overlapped by the subsequent width a minimum of 2”-5” inches. The Contractor shall follow the manufacturer's installation recommendations to ensure proper completion of the fabric installation, including top toe-in and bottom toe wrap.

B. Roll the fabric down the slope. All fabric must be securely fastened to soil surface by placing staples/stakes in appropriate locations in accordance with manufacturer recommendations.

C. The edges of the fabric shall be staples with an approximately 2”-5” overlap.

END OF SECTION 31 25 00

SECTION 31 50 00 – SUPPORT OF EXCAVATION

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. This section covers wood and steel sheeting or soldier piles and lagging with internal bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to any methods of excavation support and underpinning which the Contractor elects to use to complete the work.

B. The Contractor shall furnish and place timber or steel sheeting or soldier piles and lagging of the kinds and dimensions required, complying with these specifications, where required by regulation, indicated on the drawings or required by the Engineer.

C. Vibration monitoring shall be provided during installation and extraction of sheeting whenever the braced excavation is within 25 feet of existing structures, or in critical areas as noted in the contract documents, or as requested by the Engineer.

D. Routine monitoring of the in-place excavation support system shall be provided.

1.2 RELATED WORK:

A. Section 31 00 00, EARTHWORK

B. Section 31 23 19, DEWATERING

1.3 QUALITY ASSURANCE:

A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Safety and Department of Labor, Division of Occupational Safety “Excavation & Trench Safety Regulation (520 CMR 14.00)” and “Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.).” Contractors shall be familiar with the requirements of these regulations.

B. The Contractor is responsible for the adequacy of the excavation support system and shall retain the services of a Professional Engineer registered in the state where the project is located to design the required excavation support systems. The Contractor's Professional Engineer shall practice in a discipline applicable to excavation work, shall have experience in the design of excavation support systems and shall design in conformance with OSHA requirements. The Contractor's Professional Engineer shall provide sufficient on-site inspection and supervision to assure that the excavation support system is installed and functions in accordance with its design. Criteria listed herein defining the responsibilities of the Contractor's Professional Engineer are minimum requirements.

1.4 REFERENCES:

The following standards form a part of this specification as referenced herein.

ASTM International (ASTM)

ASTM	A6	General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
ASTM	A328	Steel Sheet Piling

1.5 SUBMITTALS:

A. At least three weeks before starting installation of the excavation support system, the Contractor shall submit the attached Certificate of Design completed and signed by the Contractor and the Professional Engineer, identifying the Contractor's Professional Engineer who will be responsible for design of the excavation support system, and in accordance with Section 01 33 23, including, for record purposes only:

1. An overall time schedule for construction of the braced excavation system.

2. A description of the anticipated sequence of construction.

3. a. Complete details of braced excavation methods, equipment and sizes and lengths of materials proposed to be used.

   b. Details of vibration monitoring devices and reports.

   c. Details of the means and methods that will be used in monitoring the integrity of the support system during its entire period of use to ensure the safety of the excavation.

   d. Complete computations for the design of the braced excavation system bearing the seal of the responsible Professional Engineer duly registered licensed to practice within a discipline applicable to excavation work, in the state where the project is located.

   e. Any other pertinent data required for record purposes by the Engineer.

B. Receipt of the information by the Engineer will not relieve the Contractor of the sole responsibility for the adequacy of the braced excavation system, and for assuring that there will be no resulting damage to adjacent pavement, utilities or structures, and for providing safe conditions within the sheeted areas.

C. Further for the record, upon completion of the work of this section, the Contractor shall submit all records of survey, vibration monitoring and inspection of existing structures to the Owner's Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Timber sheeting shall be sound spruce, pine, or hemlock, and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2-inches thick.

B. Where steel sheet piling is indicated on the drawings or installation is ordered by the Engineer or required by OSHA standards, the material shall be of such size and strength as required by the excavation support design prepared and submitted by the Contractor's Professional Engineer. Steel sheet piling may be new or used material but shall not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength. Steel sheeting shall be an approved standard section, weighing not less than 22 pounds per square foot of wall and conforming to ASTM A6 and A328.

C. Where soldier piles and lagging are used, the steel piles shall conform to ASTM A6, and the lagging shall meet the requirements for timber sheeting, as defined above.

D. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design prepared and submitted by the Contractor's Professional Engineer. Timber or steel used for bracing shall be new or undamaged used material, which does not contain splices, cutouts, patches, or other alterations, which would impair its integrity or strength.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Work shall not be started until all materials and equipment necessary for construction are either on the site of the work or satisfactorily available for immediate use as required.

B. The sheeting/lagging shall be sufficiently tight to minimize any resulting lowering of the groundwater level outside the excavation, as required in Section 31 23 19, DEWATERING.

C. The sheeting/piling shall be driven by approved means to the design elevation. No ends or edges of sheeting/piling shall be left exposed in a manner, which could create a possible hazard to the safety of the public or a hindrance to traffic of any kind.

D. If boulders or very dense soils are encountered, making it impractical to drive a sheeting/piling section to the desired depth, the section shall be treated as directed by the Contractor's Engineer.

E. Within seven days of completing the initial installation of the earth support system, the Contractor shall submit a certification from its Professional Engineer, stating that the excavation support system as installed is in general compliance with the design or approved modifications thereto.

F. The sheeting/piling shall be left in place where indicated on the drawings or required by the Engineer in writing. At all other locations, the sheeting/piling may be left in place or salvaged at the option of the Contractor. Wood or steel sheeting/piling permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise required.

G. All cut-off material is the property of the Contractor and shall be promptly removed by it from the site.

H. The satisfactory construction and maintenance of the excavation support system, complete in place, shall be the responsibility of the Contractor.

I. The Contractor shall be responsible for promptly repairing all damage to adjacent structures caused by the installation, performance, or removal of the excavation support system.

END OF SECTION 31 50 00

(Certificate of Design follows this page)

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: ______________________________
(Name)
and
CONTRACTOR: ______________________________
(Name)
on
CONTRACT: ______________________________
(Title)

____
(Number) (Date)

The undersigned hereby certify that the engineer listed below:

1. Is licensed or registered to perform professional engineering work in the state of ____________________;
(Location of Project)

2. Is qualified by education and training to design the ______________________________ specified in Section _______ of subject contract;

3. Has previously designed comparable excavation support systems;

4. Has prepared the design in full compliance with the requirements of subject contract, including all applicable laws, regulations, rules, and codes; and

5. Will inspect and supervise installation of the excavation support system and will monitor the in-place system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	ENGINEER
By:______________________________ (Signature)	By:______________________________ (Signature)
______________________________ (Name)	______________________________ (Name)
______________________________ (Title)	______________________________ (Engineering Discipline)
______________________________ (Date)	______________________________ (Date)

SECTION 32 12 00 – HOT MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 WORK INCLUDED:

The Contractor shall furnish all labor, materials and equipment and shall replace the pavements as indicated on the drawings and as herein specified.

1.2 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 14 19.16, DUST CONTROL

C. Section 31 00 00, EARTHWORK

D. Section 33 39 13, PRECAST MANHOLES AND CATCH BASINS

1.3 SYSTEM DESCRIPTION:

A. GENERAL

The types of pavement systems to be utilized on this project are as follows:

TYPE 1. PERMANENT HEAVY DUTY PAVEMENT
TYPE 2. TEMPORARY TRENCH PAVEMENT

PAVEMENT SCHEDULE

B. TYPE 1. PERMANENT HEAVY DUTY PAVEMENT

Permanent heavy-duty pavement shall be installed in the locations indicated in the Drawings. Base and binder courses shall be installed with course thicknesses as specified by the Typical Pavement Section Detail in the Drawings. Top course pavement shall be installed as part of a future project phase and separate bid.

C. TYPE 2. TEMPORARY TRENCH PAVEMENT

Any areas requiring temporary trench paving during construction shall be paved with 2-inch-thick binder, as soon as practicable after installation of utilities. Temporary trench pavement shall be maintained a minimum of 90 days or for at least one season freeze/thaw cycle prior to installation of permanent trench pavement. This may require that the temporary pavement be maintained until the following year, at which time the permanent pavement should be installed.

1.4 REFERENCES:

The following standards form a part of these specifications and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM D1557	Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-Inch Drop

Massachusetts Department of Transportation (MassDOT)
Standard Specifications for Highways and Bridges

MassDOT	401	Gravel Sub-Base
MassDOT	402	Dense Graded Crushed Stone for Sub-base
MassDOT	403	Reclaimed Pavement for Base Course and/or Sub-Base
MassDOT	404	Reclaimed Pavement Borrow Material
MassDOT	450	Hot Mix Asphalt Pavement
MassDOT	460	Hot Mix Asphalt Pavement for Local Streets
MassDOT	472	Temporary Asphalt Patching
MassDOT	476	Cement Concrete Pavement
MassDOT	860	Reflectorized Pavement Markings

Federal Specifications

SS-S-1401	Sealants, Joint, Non-Jet-Fuel-Resistant, Hot Applied, for Portland Cement and Asphalt Concrete Pavement

AASHTO Standard Specifications for Materials and Methods of Sampling and Testing

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Complete job mix formula shall be submitted to the Engineer at least two weeks before any of the work of this section is to begin.

PART 2 - PRODUCTS

2.1 GRAVEL SUBBASE:

A. Gravel subbase shall consist of inert material that is hard durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials.

B. Gradation requirements for gravel subbase shall be as specified in Section 31 00 00, EARTHWORK for Gravel Borrow.

2.2 HOT MIX ASPHALT PAVEMENT:

A. Pavements shall consist of hot mix asphalt. Mix design shall be in accordance with MassDOT M3.11.4.

B. All hot mix asphalt intermediate courses, base courses, and leveling courses shall be supported by volumetric mixture design using the SUPERPAVE Mixture Design system and conform to mixture types listed in MassDOT Section 450.

C. The joint sealant shall be a hot poured rubberized emulsified asphalt sealant meeting the requirements of FS SS-S-1401.

D. The tack coat shall be an asphalt emulsion, RS-1 if required, conforming to MassDOT Section M3.03.0.

E. Submit proposed job mix formula for each hot mix asphalt mixture type.

2.3 SEAL COAT:

A. Seal coats shall be within the composition limits for protective seal coat emulsion in accordance with MassDOT M3.03.3.

B. Silica sand when blended with seal coat emulsion shall be No. 30 silica sand.

2.4 PAVEMENT MARKINGS:

A. (Not applicable).

2.5 PAINT FOR PARKING LOTS

A. (Not applicable).

PART 3 - EXECUTION

3.1 GENERAL:

Paving courses required for the project shall be as shown on the drawings and as specified herein. Pavement thicknesses specified are measured in compacted inches. If a pavement course thickness exceeds 2-1/2 compacted inches, the course shall be installed in multiple lifts with each lift not exceeding 2-1/2 compacted inches in thickness.

3.2 GRAVEL SUBBASE:

A. The gravel subbase to be placed under pavement shall be evenly spread and thoroughly compacted and shall have a course thickness as indicated in the Drawings.

B. The gravel shall be spread in layers not more than 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.

3.3 TEMPORARY PAVEMENT:

A. Where specified and required by the Engineer and after placement of the gravel subbase, the Contractor shall place temporary pavement above the trench, between the edges of the existing pavement. It shall consist of hot mix asphalt, 2-inches thick, in accordance with MassDOT 450.43.C.

B. The temporary pavement shall be repaired as necessary to maintain the surface of the pavement until replaced by permanent pavement. When so required by the Engineer, the Contractor shall remove the temporary pavement and install or regrade the subbase for installation of permanent pavement.

3.4 PERMANENT PAVEMENT:

A. The hot mix asphalt paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with MassDOT 460.

B. BASE COURSE AND BINDER COURSE PAVEMENT:

1. Immediately prior to installing the base and/or binder course, the trimmed edges shall be made stable and unyielding, free of loose or broken pieces and all edges shall be thoroughly broomed clean. Contact surfaces of trench sides, curbings, manholes, catch basins, or other appurtenant structures in the pavement shall be

painted thoroughly with a uniform coating of asphalt emulsion (tack coat), just before any mixture is placed against them.

2. The binder course shall be repaired as necessary to maintain the surface of the pavement until placement of the permanent overlay. If required, the Contractor shall place a leveling course before placing the permanent overlay.

3.5 PAVEMENT PLACEMENT:

A. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing the pavement shall be used in conformance with MassDOT Subsection 450.48. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width and crown. The mixtures shall be placed and compacted only at such times as to permit proper inspection and checking by the Engineer.

B. After the paving mixtures have been properly spread, initial and intermediate compaction shall be obtained by the use of steel wheel rollers.

C. Where there is no backing for the edges of the curb-to-curb pavement, the Contractor shall provide a gravel transition. The gravel transition shall be installed immediately after the pavement is placed, shall be feathered and extend a minimum of 18-inches, and shall be compacted using the same equipment as for pavement compaction. The gravel shall be uniformly graded material with a maximum size of 3/8- to ½-inch.

D. When required by the Engineer, the Contractor shall furnish and install additional paving to provide satisfactory transition for driveways and walkways impacted by a new curb-to-curb pavement installation. The transition installation will be considered incidental to the curb-to-curb pavement installation.

3.6 ADDITIONAL PAVING:

A. If the Engineer determines that the existing bituminous concrete pavement on local streets is thicker than the permanent pavement specified herein, the Contractor may be required to install hot mix asphalt to obtain the depth of the existing pavement.

B. If for the installation of full width paving, the Engineer determines that the existing road surface requires additional leveling pavement, then the Contractor shall install additional hot mix asphalt to bring the section to proper line and cross section. Additional paving required to restore the proper line and cross section of binder course installed by the Contractor which has become rough and uneven shall be furnished and installed at the expense of the Contractor.

3.7 PARKING LOTS AND DRIVEWAYS:

A. Adjacent concrete work, slate work, sidewalks, structures, etc., shall be protected from stain and damage during the entire operation. Damaged or stained areas shall be replaced or repaired to equal their original condition.

B. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened sufficiently to prevent distortion and loss of fines, and in no case in less than 6 hours.

C. Smoothness of all areas of the finished surface shall not vary more than 1/4-inch when tested with a 16 foot straight-edge, applied both parallel to and at right angles to the centerline of the paved area. At building entrances, curbs, and other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed plus or minus 1/8-inch. Irregularities exceeding these amounts, or which retain water on the surface, shall be corrected by removing the defective work and replacing or repairing it to the satisfaction of the Engineer.

3.8 RAISING AND ADJUSTING CASTINGS:

A. In areas of permanent paving, any existing municipally-owned catch basin and manhole castings and valve boxes that may be present shall be raised to the proper grade where required by the Engineer.

B. Castings owned by private utilities shall be raised by their own forces. The Contractor shall be responsible for coordinating this work.

C. The method of adjusting these castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8-inches from casting. Excavate and if required rebuild up to 12-inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting. Place high, early strength cement or bituminous concrete collar, as directed, to approximately 1½-inches below the raised casting grade. Masonry work shall conform to Section 33 39 13, PRECAST MANHOLES AND CATCH BASINS.

D. In some areas, raising of castings may not be required. Where required by the Engineer, castings not to be raised shall have at least 12-inches of bituminous concrete pavement chipped and removed around the casting. New bituminous concrete pavement shall be placed and compacted around such castings to approximately 1-1/2-inches below the top of the casting. The overlay course shall then be sloped down to the level of the casting.

E. The method of raising valve boxes shall be as follows: Cut around valve box a minimum of 8-inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement or bituminous concrete collar, as directed, to approximately 1-1/2-inches below the top of the valve box.

F. Castings which need to be raised or adjusted to complete permanent curb to curb paving shall be done immediately prior to paving.

3.9 PAVEMENT REPAIR:

A. If required in the contract or if permanent pavement becomes rough or uneven, permanent pavement patches and trenches shall be repaired and brought to grade utilizing "infrared" paving methods following completion of the construction.

B. The Contractor performing the work shall use care to avoid overheating the pavement being repaired.

C. Pavement repair shall extend a minimum of 6-inches beyond all edges of the pavement patch to assure adequate bonding at the pavement joints.

END OF SECTION 32 12 00

SECTION 32 16 00 – CURBING

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. This section covers furnishing and installation of granite curb and hot mix asphalt berm, where required, as shown on the Drawings and herein specified.

1.2 RELATED WORK:

A. Required earthwork is specified under Section 31 00 00 EARTHWORK.

B. Section 32 12 00, PAVING.

1.3 REFERENCES:

The following standards form a part of these specifications, as referenced:

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings, showing dimensions of typical curb sections.

PART 2 - PRODUCTS

2.1 GRANITE CURBING:

A. Granite curbing shall be Type VAI conforming to Subsection M9.04.1 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.

B. Special shapes and corners shall be supplied as required.

2.2 GRANITE EDGING:

A. Granite edging shall be Type SB conforming to Subsection M9.04.2 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.

B. Special shapes and corners shall be supplied as required.

2.3 HOT MIX ASPHALT BERM

Berm shall conform to Subsection M3.11.6 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.

PART 3 - EXECUTION

3.1 GRANITE CURBING:

A. Removal and resetting and/or removal and replacing of granite curbing shall be in accordance with Subsection 580 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges. The curbing shall have a 6-inch reveal unless otherwise required by the Engineer.

B. Except as modified herein or on the drawings, installation of curbing shall conform to Section 500 of the MassDOT Standard Specifications for Highways and Bridges.

C. Excavation shall be made to the bottom of the gravel base below the curbing, the trench being sufficiently wide to permit thorough tamping. The base shall be compacted to a firm, even surface and shall be approved by the Engineer.

D. The curbing shall be set on edge and settled into place with a heavy wooden hand-rammer, to the line and grade required, straight and true for the full depth. The joints of the stone curbing shall be pointed with mortar for the full depth of the curbing. At approximately 50-foot intervals, a 1/2-inch joint shall not be filled with mortar but left free for expansion. The ends of the stone curbing at driveways and intersections shall be cut at a bevel or rounded as required by the Engineer.

E. The trench for the stone curbing shall be backfilled with approved material; the first layer to be 4 inches in depth, thoroughly rammed; the other layers to be more than 6 inches in depth and thoroughly rammed until the trench is filled.

F. Where indicated on the plans, or as required, drainage openings shall be made through the curbing at the elevations and of the size required.

3.2 GRANITE EDGING:

A. Except as modified herein and on the drawings, installation of granite edging shall conform to Section 500 of MassDOT Standard Specifications for Highways and Bridges.

B. The cement concrete base shall be placed on a well-tamped sub-base acceptable to the Engineer, and shall be constructed of 3000 psi concrete, minimum, as shown on the drawings.

C. The edging shall be set to the proper lines and grades on the concrete base and on a well-tamped sloping gravel surface.

3.3 HOT MIX ASPHALT BERM:

A. Unless modified herein, installation shall conform to the detail provided in the Drawings and Section 501.64 of the MassDOT Standard Specifications for Highways and Bridges.

END OF SECTION 32 16 00

SECTION 32 31 13 – CHAIN LINK FENCE

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. The Contractor shall provide all labor, materials and appurtenances necessary for the installation of a complete chain link fence systems and shall meet or exceed the standards of the Chain Link Fence Manufacturer's Institute, New York, NY except as otherwise indicated on the Drawings and as herein specified.

B. The manufacturer shall supply a total vinyl PVC coated chain link fence system of the height, fabric type, fabric gauge, framework strength, color and coating specifications contained herein. All fence materials unless specifically stated otherwise, shall be extrusion bonded polyvinyl chloride (PVC) coated.

1.2 RELATED WORK:

A. Section 01 33 00, SUBMITTAL PROCEDURES

B. Section 03 05 00, FIELD CONCRETE

1.3 REFERENCES:

A. The following standards form a part of this specification as referenced.

ASTM International (ASTM)

ASTM	A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM	A121	Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM	A392	Zinc Coated Steel Chain Link Fence Fabric
ASTM	A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	F567	Installation of Chain Link Fence
ASTM	F626	Fence Fittings
ASTM	F668	Specification for Poly Vinyl Chloride (PVC) - Coated Steel Chain-Link Fence Fabric.

ASTM	F1043	Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

Federal Specifications (FS)

FS RR-F-191	Fencing Wire and Post, Metal (and Gates, Chain-Link Fabric, and Accessories)

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer’s literature of the materials specified herein.

B. Shop drawings of the fence and the proposed color.

1.5 WARRANTY:

A. Prior to installation, the fence contractor shall provide the fence manufacturer's notarized certification that all **PVC coated** components are fully warranted by the manufacturer for **15** years against rust and corrosion.

PART 2 - PRODUCTS - PVC COATED

2.1 STEEL FRAMEWORK (GENERAL):

A. All posts, gate frames, braces and horizontal rails shall be Type I round post, hot dipped galvanized with a minimum average coating of 1.8 oz/ft², meeting ASTM F 1083 for Standard Weight Galvanized Pipe and shall be of the sizes and weights given below or other approved equivalent sections of steel having a minimum tensile strength of 50,000 pounds per square inch and a minimum yield strength of 25,000 pounds per square inch.

B. Minimum cross-section dimensions for line posts of specified shape shall be either 2-3/8-inch (2.375-inch) outside diameter steel pipe weighing not less than 3.65 pounds per linear foot; or 2.25 by l.95 by 9/64-inch steel H section weighing not less than 4.10 pounds per linear foot.

C. Minimum cross-section dimensions for end, corner, and pull posts of specified shape shall be: 2-7/8-in. (2.875-in.) outside diameter steel pipe weighing not less than 5.79 pounds per linear foot; 2-l/2 by 2-l/2-inch square tubes weighing not less than 5.70 pounds per linear foot; or 3-l/2 by 3-l/2-inch rolled-formed sections weighing not less than 8.14 pounds per linear foot.

D. All tubular and pipe posts shall be capped to prevent precipitation from entering the post, unless a barbed wire extension arm assembly acts as a cap.

E. Posts, other fence framework, accessories, fittings, and miscellaneous items shall be galvanized and have an extrusion bonded polyvinyl chloride (PVC) coating. The PVC coating on posts shall be a minimum of 10 mils thick. Framework color coating shall match fabric. Galvanized finish shall have not less than the following weight of zinc per square foot:

1. Pipe: 1.8 oz, complying with ASTM A53.
2. H-sections and square tubing: 2.0 oz, complying with ASTM A123.
3. Hardware and accessories: Comply with Table I of ASTM A153.

F. For top railings and top, middle and bottom braces between terminal posts and adjacent lines posts, the minimum cross-section dimensions for the specified shall be 1-5/8-inch outside diameter steel pipe weighing not less than 2.26 pounds per linear foot.

G. Diagonal truss braces between terminal and adjacent line posts and for gauge framework shall not be less that either 3/8-inch diameter steel rod or double No. 9 AWG steel wire stranded together.

H. Fittings shall be galvanized press steel, malleable or cast steel as specified in ASTM F626 and Federal Specification RR-F-191.

I. Where posts do not have provisions for weaving fence fabric to posts, tension or stretcher bars for attaching fabric to terminal posts such as end, corner, gauge and pull posts, shall be flat bar with nominal dimensions no less than 3/16 by 3/4-inch for use with fence fabric having mesh larger than l-inch, of a length equal to full height of the fence fabric, and used with bar bands, bolts and nuts. Bar bands shall be no thinner than No. 11 gauge coated sheet steel. Bolt diameters shall be not less than 3/8-inch for use with bar bands.

J. Ties for fastening fence fabric to line posts and rails shall be not less than No. 9 AWG steel wire with the same coating as the fence fabric or other approved bands.

2.2 CHAIN LINK FENCE FABRIC – PVC COATED:

A. Vinyl coated fabric shall be supplied with Class 2A (extrusion bonded) vinyl coating. The coating shall be applied over a galvanized steel core wire and be manufactured in accordance with Federal Specifications RR-F-191 and ASTM F668. The PVC coating shall have a final coating thickness of 0.015-0.025-inch and a core wire size diameter of 0.148-inch.

B. Wire size: The finished wire size shall be 6 gauge.

C. Height and Mesh Size: The fabric height shall be 6 feet high with a mesh size of 2-inches.

D. Selvage: Top edge and bottom edge of the fabric shall be knuckled.

E. The tension wires shall either be No. 9 gauge steel-core wire. PVC coating shall conform to ASTM F668 Class 2a or 2b. Also, a 7-strand galvanized steel ½-inch guy wire with PVC coating may be supplied.

F. The polyvinyl chloride (PVC) coating shall be free of voids, shall be dense and impervious, shall be of a plasticized or epoxy modified, high specific gravity polyvinyl chloride with high resistance to tear and suitable hardness. The PVC coating shall not support combustion and shall withstand an accelerated aging and weathering test a minimum of 2,000 hours at 145 degrees F with ultraviolet and salt spray without cracking or peeling the PVC coating and without corrosion of the base metal. The PVC coating shall withstand a mandrel bending test of ten times the thickness of the base metal at minus 25 degrees F without cracking. The PVC coating shall not separate from the metal or shrink. Color used in PVC coating shall be stabilized so that it will not fade under long exposure to sunlight. Color shall be approved by the Engineer as selected from the manufacturer's standard colors.

G. Hog rings shall be 11 gauge steel core, PVC coated.

H. Privacy slats shall be installed along the entire length of the fence for additional privacy screening in accordance with the detail in the drawings.

PART 3 - EXECUTION

3.1 ERECTION:

A. The fence and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer and these specifications. These specifications shall take precedence over the recommendations of the manufacturer if any discrepancy exists between them.

B. Maximum post spacing shall be 8 feet. Post spacing shall be uniform and posts shall be plumb. All end, corner, pull and gate posts must be set in concrete. Line posts may be secured by driven blades.

C. Concrete post foundations in earth shall be concrete cylinders with a minimum diameter of 12-inches, crowned at grade to shed water, and shall extend not less than 3-feet into the ground. Posts shall be set in the full depth of the foundations except for 3-inches of concrete under the posts. If foundation holes are excavated in unsuitable material, the Engineer shall be notified for determination of suitable construction precautions.

D. If solid rock is encountered without an overburden of soil, poles shall be set into the rock a minimum depth of 12-inches for line posts and 18-inches for terminal posts, such as end, corner, gate and pull posts, and grouted into solid rock with the post hole diameter a minimum of one inch larger than that of the post.

E. Where solid rock is covered by an overburden of soil or loose rock, the posts shall be set into the rock as specified above. The total pole setting depth shall not exceed the depths required for setting in earth.

F. Any change in direction of fence line of 30 degrees or more shall be considered as a corner. Pull posts shall be used at all abrupt changes in grade. The maximum area of unbraced fence shall not exceed l,500 square feet.

G. Terminal posts such as end, corner, gate and pull posts shall be braced to the adjacent post(s) with horizontal rail braces used as compression members and diagonal truss braces with truss tighteners for tension members, with the lower ends at the terminal post in each panel of fence framework as indicated in detail on drawings.

H. The top railing shall pass through intermediate or line post tops, form a continuous brace with all splices made by approved couplings, and shall be fastened to terminal posts.

I. Fabric shall be stretched taut, with the bottom edge following the finished grade, and shall be a continuous mesh between terminal posts. Each span of fabric shall be attached independently at terminal posts. Where terminal posts do not have provisions for weaving fabric to posts, stretcher bars shall be placed through the end weave of the fabric and secured to the post with bar bands spaced not more than 15-inches apart on the post.

J. Fabric shall be attached with ties to line posts at intervals of not more than 14-inches (and to the top and bottom railing and braces at intervals not exceeding 24-inches).

END OF SECTION 32 31 13

SECTION 32 32 23.13 – SEGMENTAL RETAINING WALL SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Work shall consist of designing, furnishing all materials, labor, equipment, and installation of the segmental retaining wall system (SRW) in accordance with these specifications and to the lines, grades, and dimensions shown on the plans.

1.2 RELATED WORK:

A. Section 01 33 00, SUBMITTAL PROCEDURES

B. Section 31 00 00, EARTHWORK

C. Section 31 23 19, DEWATERING

D Section 31 50 00, SUPPORT OF EXCAVATION

1.3 REFERENCE STANDARDS:

A. The Massachusetts Department of Transportation Standard Specifications for Highways and Bridges Construction.

B. Segmental Retaining Wall Units

1. ASTM C 1372 - Standard Specification for Segmental Retaining Wall Units
2. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units

C. Geosynthetic Reinforcement

1. ASTM D 4595 - Tensile Properties of Geotextiles by the Wide-Width Strip Method
2. ASTM D 5262 - Test Method for Evaluating the Unconfined Creep Behavior of Geosynthetics
3. GRI:GG1 - Single Rib Geogrid Tensile Strength
4. GRI:GG5 - Geogrid Pullout

D. Soils

1. ASTM D 1557 - Moisture Density Relationship for Soils, Modified Method
2. ASTM D 6913 - Gradation of Soils

3. ASTM D 424 - Atterberg Limits of Soil

E. Drainage Pipe

1. ASTM D 3034 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe
2. ASTM D 1248 - Specification for Corrugated Plastic Pipe

F. Engineering Design

1. Federal Highway Administration Publication No. FHWA-NHI-10-024, “Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Slopes,” Latest Edition
2. “National Concrete Masonry Association (NCMA) Design Manual for Segmental Retaining Walls,” Latest Edition

G. Where specifications and reference documents conflict, the Engineer shall make the final determination of applicable document.

1.4 QUALITY ASSURANCE

A. The Contractor shall be responsible for the design, construction, and performance of all aspects of the SRW system as described herein. The Contractor shall be responsible for the proper construction and performance of all earthwork related to performance of the SRW including, but not limited to, subgrade, leveling pads, reinforced backfill, drainage, and any other requirements of the SRW design.

B. The Contractor shall retain the services of a professional engineer (P.E.) registered in the Commonwealth of Massachusetts to design the SRW system as specified herein and as shown on the plans. The Contractor’s PE. shall practice in geotechnical or structural engineering and shall have experience on a minimum of 15 projects of similar scope and complexity. The Contractor’s P.E. shall provide sufficient on-site inspection and supervision to assure that the SRW is installed and functions in accordance with their design.

C. The wall installer (Contractor) shall have a minimum of 5 years of experience with the installation of the type of SRW system included in the design and shall have completed at least 15 projects of similar size and complexity to this project.

1.5 DESIGN CRITERIA:

A. The following soil parameters shall be assumed for the final design unless otherwise shown on the plans or specified by the Engineer:

	Unit Weight (pcf)	Internal Friction Angle, degrees	Cohesion
Reinforced Fill	125	32	0
Retained Soil	125	32	0
Foundation Soil	125	32	0

Per the Geotechnical Report prepared by Lahlaf Geotechnical Consulting, Inc., dated March 7, 2023, the following lateral earth pressures are recommended for the design of retaining walls on-site:

Coefficient of Active Earth Pressure: 0.31
Coefficient of At-Rest Earth Pressure: 0.47
Coefficient of Passive Earth Pressure: 3.3

These values are based on a friction angle for backfill of 32 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and a vertical wall face.

B. Retaining walls shall be designed to withstand lateral loads due to soil, sloping ground, groundwater, seismic, retained structures, surcharges, and all other loads as applicable and as required by codes governing the Work.

C. Should the actual soil conditions observed during construction differ from those assumed for the design, design shall be reviewed by the Contractor’s wall designer as required by the Engineer.

D. The design for the final retaining wall plans shall be prepared and sealed by the Contractor’s wall designer. The design analysis shall consider the external stability against sliding and overturning, internal stability, facial stability of the reinforced soil mass, and external global stability and shall be in accordance with acceptable engineering practice and these specifications. The internal and external stability analysis shall be performed in accordance with the “NCMA Design Manual for Segmental Retaining Walls”, using the recommended minimum factors of safety in this manual. The minimum static factor of safety against external global instability shall be 1.5 for static conditions and 1.2 for seismic design. The external global stability analysis shall account for a minimum of 2 feet of over excavation in front of the SRW system.

E. The design of the geosynthetic reinforcement shall take into consideration the effects from ancillary site features such as penetrations from guardrails, fence posts, drainage structures, etc.

F. Minimum embedment: the minimum wall embedment shall be the greater of 1.0 feet or the following:

Level Slope in Front	H’/20
3H:1V Slope in Front	H’/10
2H:1V Slope in Front	H’/10

where H’ is the exposed height of the wall.

G. While vertical spacing between geosynthetic reinforcement layers may vary, it shall not exceed 2.0 feet maximum in the wall design.

H. The geosynthetic reinforcement placement in the wall design shall have 100 percent continuous coverage parallel to the wall face. Gapping between horizontally adjacent layers of geosynthetic (partial coverage) will not be allowed.

1.6 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Submit qualifications for the Contractor’s wall designer and the wall installer to the Engineer for review and approval at least 5 weeks prior to start of work.

B. Submit samples of proposed wall facing material to the Engineer for review and approval at least 4 weeks prior to construction.

C. Material Submittals: Manufacturers' literature and certifications two weeks prior to start of work stating that the SRW units and geosynthetic reinforcement meet the requirements of Section 2 of this specification.

D. Design Submittal: Detailed design calculations and final retaining wall plans at least two weeks prior to the beginning of wall construction. All calculations and drawings shall be prepared and sealed by the Contractor’s wall designer that is a licensed Professional Engineer in the Commonwealth of Massachusetts.

1.6 DELIVERY AND STORAGE:

A. Contractor shall check materials upon delivery to assure that specified type and grade of materials have been received and proper color and texture of SRW units have been received.

B. Contractor shall store and handle materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.

C. Contractor shall protect materials from damage. Damaged materials shall not be incorporated into the retaining wall. Geogrids shall be protected and stored to avoid damage from sunlight exposure.

PART 2 - PRODUCTS

2.1 CONCRETE SEGMENTAL RETAINING WALL (SRW) UNITS:

A. SRW units shall be Redi-Rock Wall System as manufactured by Redi-Rock International, Shea Wall System units as manufactured by E.F. Shea/New England Concrete Products, Inc., VERSA-LOK Standard Retaining Wall Units, or an approved equal. Minimum height of SRW block shall be 18-inches.

B. Texture on the face of the block shall be as approved by the Owner or Engineer. SRW shall be offered with a finish from manufacturer’s full range of finishes. To establish a minimum number of finishes and quality of finishes, the following Redi-Rock finishes (or similar finishes offered by an equal) shall be offered at no additional cost:

a. Ledgestone

b. Cobblestone,

c. Limestone

d. Kingstone.

C. If connectors are used by the SRW supplier to interconnect the SRW units, they shall meet the requirements of the manufacturer.

D. SRW units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the structure. Cracking or excessive chipping may be grounds for rejection. Units showing cracks longer than ½-inch shall not be used within the wall. Units with visible damage shall not be used within the wall.

E. Concrete used to manufacture SRW units shall have a minimum 28 days compressive strength of 4,000 psi and a maximum moisture absorption rate, by weight, of 8% as determined in accordance with ASTM C1372. Compressive strength test specimens shall conform to the saw-cut coupon provisions of ASTM C140.

F. SRW concrete units shall have adequate freeze/thaw protection and meet the requirements of ASTM C1262. SRW concrete units shall be resistant to deterioration from salt and/or deicing materials

G. SRW units' molded dimensions shall not differ more than + 1/8-inch from that specified, in accordance with ASTM C1372.

2.2 GEOSYNTHETIC REINFORCEMENT:

A. Geosynthetic reinforcement shall consist of geogrids or geotextiles manufactured as a soil reinforcement element. The type, strength, and placement location of the reinforcing goesynthetic shall be determined by the Contractor’s wall designer and as shown on the approved segmental retaining wall plans.

B. Detailed test data shall be submitted to the Engineer for approval and shall include the following:

1. Tensile strength in accordance with ASTM D 4595 or GRI GG-1.
2. Creep in accordance with ASTM D 5262.
3. Site damage and durability in accordance with GRI GG-4.
4. Pullout in accordance with GRI GG-5 or GRI GT-6
5. Connection test data in accordance with NCMA SRWU-1.

2.3 LEVELING PAD:

A. Material for the leveling pad shall consist of crushed stone meeting the requirements of MassDOT Section M2.01.3 or M2.01.4 and shall be a minimum of 12-inches in depth unless otherwise shown on the Contract Drawings. The leveling pad must extend a minimum of 6-inches from both the front and back faces of the block unless otherwise shown on the Contract Drawings. Lean concrete with a strength of 200-300 psi and three inches thick maximum may also be used as a leveling pad material with approval by the Engineer.

2.4 DRAINAGE AGGREGATE:

A. Drainage aggregate shall be crushed stone meeting the requirements of MassDOTSection M2.01.4.

2.5 DRAINAGE PIPE:

A. The drainage collection pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe. The drainage pipe may be wrapped with a geotextile to function as a filter.

B. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.

2.6 REINFORCED BACKFILL:

A. The reinforced backfill shall be free of debris. Unless otherwise noted on the approved segmental retaining wall plans prepared by the Contractor’s wall designer, the reinforced material shall consist of Type B Gravel Borrow in accordance with MassDOT Section M1.03.0.

2.7 GEOTEXTILE FABRIC:

A. Geotextile fabric shall meet the requirements of section 31 00 00 - EARTHWORK

PART 3 - EXECUTION

3.1 INSPECTION:

A. Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

3.2 EXCAVATION:

A. Excavations shall be made in accordance with Section 31 00 00 – EARTHWORK.

B. Contractor shall excavate to the lines and grades shown on the project grading plans. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted backfill material as required by the Engineer, at the Contractor's expense.

C. Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of wall excavation. Excavation support, if required, is the responsibility of the Contractor and shall be in accordance with Section 31 50 00 - SUPPORT OF EXCAVATION.

3.3 FOUNDATION PREPARATION:

A. Foundation subgrades shall be prepared in accordance with Section 31 00 00-EARTHWORK and observed by the Engineer prior to placement of overlying materials including leveling pad and SRW units.

3.4 LEVELING PAD CONSTRUCTION:

A. Leveling pad shall be placed as shown on the final, approved P.E. sealed retaining wall drawings. The leveling pad shall have a minimum thickness of 12-inches unless otherwise required by the Contractor’s wall designer. The leveling pad should extend laterally at least a distance of 6-inches from the toe and heel of the lower most SRW unit unless shown otherwise on the Contract Drawings.

3.5 SRW UNIT INSTALLATION:

A. All SRW units shall be installed at the proper elevation and orientation as shown on the final, approved P.E. sealed wall drawings or as required by the manufacturer’s Wall Design Engineer. The SRW units and geosynthetic reinforcement shall be installed in accordance with the manufacturer's recommendations.

B. First course of SRW units shall be placed on the leveling pad with the aesthetic surface facing out. The units shall be leveled side-to-side, front-to-rear and with adjacent units, and aligned to ensure intimate contact with the leveling pad.

C. Prior to placement of next course, the level and alignment of the units shall be checked and corrected, where needed.

D. The overall tolerance for wall verticality or batter shall not exceed 1-¼ inches maximum over a 10-ft. distance, or a maximum of 3 inches.

E. Layout of curves and corners shall be installed in accordance with the wall plan details or in general accordance with SRW manufacturer's installation guidelines. Walls meeting at corners shall be interlocked by overlapping successive courses.

F. Broken, chipped, stained or otherwise damaged units shall not be placed in the wall unless they are repaired and the repair method and results are approved by the Engineer.

3.6 GEOSYNTHETIC REINFORCEMENT PLACEMENT:

A. All geosynthetic reinforcement shall be installed at the proper elevation and orientation as shown on the final, approved P.E. sealed retaining wall drawings.

B. At the elevations shown on the final plans, (after the units, drainage material, and backfill have been placed to this elevation) the geosynthetic reinforcement shall be laid horizontally on compacted infill.

C. Geosynthetic reinforcement layers shall be one continuous piece for their entire embedment length. Overlapping of the geosynthetic in the design strength direction (perpendicular to the wall face) shall not be permitted. Along the length of the wall, horizontally adjacent sections of geosynthetic reinforcement shall be butted in a manner to assure 100 percent coverage parallel to the wall face.

D. Construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum of 6-inches of backfill is required prior to operation of tracked vehicles over the geosynthetic. Turning should be kept to a minimum.

E. The geosynthetic reinforcement should be installed under tension. The nominal tension shall be applied to the reinforcement and secured in place with staples, stakes or by hand tensioning until reinforcement is covered by six inches of fill.

3.7 DRAINAGE MATERIALS:

A. Drainage aggregate shall be installed to the line, grades, and sections shown on the final P.E. sealed retaining wall drawings. Drainage aggregate shall be placed to the minimum thickness shown on the Contract Drawings between and behind units.

B. Drainage collection pipes shall be installed to maintain gravity flow of water outside the reinforced soil zone. The drainage collection pipe shall daylight at an elevation lower than the lowest point of the pipe within the aggregate drain.

C. The main collection drain pipe, just behind the block facing, shall be a minimum of 3-inches in diameter. The secondary collection drain pipes should be sloped a minimum of 2% to provide gravity flow into the main collection drain pipe. Drainage laterals shall be spaced at a maximum 50 feet spacing along the wall. Cleanouts shall be provided.

3.8 BACKFILL PLACEMENT:

A. Only hand-operated compaction equipment shall be allowed within 3 feet of the back of the wall units. Compaction within the 3 feet behind the wall units shall be achieved by at least three (3) passes of a lightweight mechanical tamper, plate, or walk-behind roller compacted to a minimum 90% of Modified Proctor density (ASTM D 1557) at a moisture content within 3% of optimum.

B. Beyond 3 feet of the back of the wall units, the reinforced backfill shall be placed as shown in the final, approved wall drawings in the maximum compacted lift thickness of 9-inches and shall be compacted to a minimum of 92% of Modified Proctor density (ASTM D 1557) at a moisture content within 3% of optimum. The backfill shall be placed and spread in such a manner as to eliminate wrinkles or movement of the geosynthetic reinforcement and the SRW units.

C. In-place compaction testing of reinforced backfill shall be performed in accordance with Section 31 00 00 – EARTHWORK.

D. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing and reinforced backfill to direct water runoff away from the wall face.

E. In unpaved areas behind retaining walls, care shall be taken by the Contractor to avoid conditions that could cause the build-up of hydrostatic pressures behind the wall during both temporary and permanent conditions.

F. At completion of wall construction, backfill shall be placed level with final top of wall elevation. If final grading, paving, landscaping, and/or storm drainage installation adjacent to the wall is not placed immediately after wall completion, temporary grading and drainage shall be provided to ensure water runoff is not directed at the wall nor allowed to collect or pond behind the wall until final construction adjacent to the wall is completed. Snow, soil stockpiles, construction materials and/or equipment shall not be stored behind the walls.

3.9 CONSTRUCTION ADJACENT TO COMPLETED WALL:

A. The Contractor is responsible for ensuring that construction adjacent to the wall does not disturb the wall or place temporary construction loads on the wall that exceed design loads, including loads such as water pressure, temporary grades, or equipment loading. Care should be taken by the Contractor to ensure water runoff is directed away from the wall structure until final grading and surface drainage collection systems are completed.

END OF SECTION 32 32 23.13

SECTION 32 91 13.13 – BIORETENTION SOIL MIX

PART 1 – GENERAL

1.1 WORK INCLUDED:

A. Section includes soil media for the bioretention systems and rain gardens specified according to performance requirements of the mixes. In general, the media is suitable for a variety of plant species; however, careful consideration of system hydrology and solar radiation should be included in plant selection.

1.2 RELATED WORK:

A. SECTION 31 00 00 EARTHWORK

B. SECTION 31 11 00 CLEARING AND GRUBBING

C. SECTION 31 25 00 EROSION AND SEDIMENT CONTROL

1.3 DEFINITIONS:

A. Bioretention Soil Mix (BSM): Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments. A soil mixture best for media filtration.

B. Cation exchange capacity (CEC): a measure of the soil's ability to hold positively charged ions.

C. Organic Matter: The total organic materials in soil and the soil biomass; also called "humus" or "soil organic matter."

D. Subgrade: Surface and/or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill above which a bioretention system is constructed.

1.4 PREINSTALLATION CONFERENCE:

A. Pre-installation Conference: Conduct conference with the Owner/Engineer at the Project site prior to commencement of construction activities.

1.5 SUBMITTALS, IN ACCORDANCE WITH SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of imported soil, soil amendment and/or fertilizer, before delivery to the site, according to the following:
    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of nonstandard materials, by a qualified testing agency.

B. Qualification Data: For each testing agency.

C. Preconstruction Test Reports: For preconstruction soil analyses specified in Section 1.07 of this Specification.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE:

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements.

1.7 TESTING REQUIREMENTS:

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil samples must be obtained during the soil characterization field analysis and classified according to ASTM D2487 (Standard Practice for Classification of Soils for Engineering Purposes [Unified Soil Classification System]) and ASTM D2488 (Standard Practice for Description and Identification of Soils [Visual-Manual Procedure]).
2. Soil samples must undergo laboratory particle size analysis according to ASTM D422 (Standard Test Method for Particle-Size Analysis of Soils).

C. Chemical Testing:

1. Cation Exchange Capacity (CEC): Analysis by sodium saturation at pH 7

D. Fertility Testing: Soil fertility analysis according to standard laboratory protocols including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Nitrogen ppm.
5. Phosphorous ppm.
6. Copper ppm.

E. Organic-Matter Content: Using ASTM D 2974-00 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils. Analysis using loss-by-ignition method.

1.8 DELIVERY, STORAGE, AND HANDLING:

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.

PART 2 - PRODUCTS

2.1 SOIL MEDIA SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS:

Particle Size Distribution according to ASTM D422 (Standard Test Method for Particle-Size Analysis of Soils).

A. Particle Size Distribution by Separates:

1. Exclude any material > 4.76 mm - 0%
2. Very Coarse Sand/Gravel: Gravel (2.0 to 4.76 mm) 5% maximum (percent by dry weight).
3. Sand (0.42 to 2.0 mm) 60 - 85% (percent by dry weight).
4. Silt (0.075 to 0.42 mm) 20% maximum (percent by dry weight).
5. Clay (less than 0.075mm) 5% maximum (percent by dry weight).

Table 1: Acceptable particle size distribution of final bioretention soil mix

Sieve #	Sieve Size in (mm)	% Passing
4	0.187 (4.76)	100
10	0.079 (2)	95
40	0.017 (0.42)	40 - 15
200	0.003 (0.075)	10 - 20
<200	Pan	0 - 5

B. Fragment Size Distribution:

1. Sticks and Roots: should be minimized and preferably limited to nothing larger than 4.76 mm
2. Debris and Other Foreign Materials: should be minimized

C. Percentage of Organic Matter: Minimum 3 percent by volume and maximum 8 percent by volume.

D. Soil Reaction: pH of 6 to 7.

E. CEC of Total Soil: Minimum 10 meq/100 mL at pH of 7.0.

F. Basis-of-Design Product: Subject to compliance with requirements indicated on Drawings

G. Basic Properties: Manufactured soil SHALL NOT contain the following:

1. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, asphalt, bricks, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, solid waste, and other extraneous materials that are harmful to plant growth.
2. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
3. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 0.187-inch (4.76 mm) in any dimension.

2.2 ACCEPTABLE ORGANIC SOIL AMENDMENTS:

A. No compost should be used in the planting mix unless specified by the Engineer.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 3.4 to 4.8.

C. Wood Derivatives: Shredded wood, wood chips, ground bark, or wood waste; of uniform texture and free of stones, sticks, soil, or toxic materials.

D. Media amendments such as zero-valent iron and/or drinking water treatment residuals (alum) to enhance phosphorus sorption as specified by the Engineer.

PART 3 - EXECUTION

3.1 GENERAL:

A. Place soil media according to requirements in other Specification Sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, asphalt/concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, solid waste, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

D. Compaction: Compact each blended lift of soil media to 75 percent of maximum Standard Proctor density according to ASTM D 698.

E. Finish Grading: Grade soil media to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.2 FIELD QUALITY CONTROL:

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698.
2. Performance Testing: For each amended soil media type, demonstrating compliance with specified performance requirements. Perform testing according to Section 1.07 of this Specification.

C. Soil media will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.3 PROTECTION:

A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

B. If soil media or subgrade is over compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the soil media and contamination; restore the subgrade as required by the Engineer and replace contaminated soil media with new soil media.

3.4 CLEANING UP:

A. Protect areas adjacent to soil media preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 32 91 13.13

SECTION 32 91 19 – LOAMING AND SEEDING

PART 1 - GENERAL

1.1 WORK INCLUDED:

This section covers all labor, materials, and equipment necessary to do all loaming, seeding and related work as indicated on the drawings and as herein specified. All lawns disturbed by the Contractor's operations shall be repaired as herein specified.

The Contractor shall bear the responsibility and cost of furnishing and applying water or any other substances, as necessary to ensure the establishment and satisfactory growth of seeded turf areas, as part of the work of this contract, until acceptance by the Engineer and/or Landscape Architect.

1.2 RELATED WORK:

A. (None)

1.3 QUALITY ASSURANCE:

A. For a particular source of loam, the Engineer and/or Landscape Architect may require the Contractor to send approximately 10 pounds of loam to an approved testing laboratory and have the following tests conducted:

1. Organic concentration
2. pH
3. Nitrogen concentration
4. Phosphorous concentration
5. Potash concentration

B. These tests shall be at the Contractor's expense. Test results, with soil conditioning and fertilizing recommendations, shall be forwarded to the Engineer and Landscape Architect.

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Information detailing the seed mixes, fertilizers, mulch material, slope protection material (if required) and origin of loam.

B. Test results.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. LOAM:

1. Loam shall be a natural, fertile, friable soil, typical of productive soils in the vicinity, obtained from naturally well-drained areas, neither excessively acid nor alkaline, and containing no substances harmful to grass growth. Loam shall not be delivered to the site in frozen or muddy condition and shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter.

2. The loam shall contain not less than 4 percent or more than 20 percent organic matter as determined by the loss of weight by ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F.

B. LIME:

Lime shall be standard commercial ground limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide), and 50 percent of the material must pass through a No. 100 mesh sieve with 98 percent passing a No. 2 mesh sieve.

C. FERTILIZER:

Fertilizer shall be commercial fertilizer, 10-10-10 fertilizer mixture containing at least 40 percent of organic nitrogen. It shall be delivered to the site in the original sealed containers, each showing the manufacturer's guaranteed analysis. Fertilizer shall be stored so that when used it will be dry and free flowing. No fertilizer shall be used which has not been marketed in accordance with State and Federal Laws, relating to fertilizers.

D. MULCH:

1. Materials to be used in mulching shall conform to the following requirements:

2. Straw Mulch - Straw Mulch shall consist of stalks or stems of grain after threshing.

3. Wood Fiber Mulch - Wood Fiber Mulch shall consist of wood fiber produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered to the project.

E. SEED:

1. Seed shall be of an approved mixture, the previous year's crop, clean, high in germinating value, a perennial variety, and low in weed seed. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates relative to mixture purity and germinating value.

2. Grass seed for lawn areas shall conform to the following requirements:

	Proportion by Weight	Germination Purity	Purity Minimum
Chewing’s Fescue	30%	70%	97%
Kentucky 31 Fescue	30%	90%	98%
Kentucky Blue Grass	20%	80%	85%
Domestic Rye Grass	20%	90%	98%

Grass seed for cross-country areas, slopes and other areas not normally mowed shall conform to the following requirements:

	Proportion by Weight	Germination Minimum	Purity Minimum
Creeping Red Fescue	50%	85%	95%
Kentucky 31	30%	85%	95%
Domestic Rye	10%	90%	98%
Red Top	5%	85%	92%
Ladino Clover	5%	85%	96%

F. TEMPORARY COVER CROP:

1. Temporary cover crop shall conform to the following requirements:

	% Weight	Germination Minimum
Winter Rye	80 min.	85%
Red Fescue (creeping)	4 min.	80%
Perennial Rye Grass	3 min.	90%
Red Clover	3 min.	90%
Other Crop Grass	0.5 max.	
Noxious Weed Seed	0.5 max.	
Inert Matter	1.0 max.	

G. SLOPE EROSION PROTECTION:

1. Erosion control blanket shall be 100% degradable plastic mesh with 100% degradable straw or straw/coconut fill. Fill shall be held together by degradable fastening. Weight shall be 0.50 lb. /sq. yd. Erosion control blankets shall be applied parallel to direction of water flow. The erosion control blankets shall be by North American Green, Evansville, IN or approved equal. For slopes 2:1 or greater, Model SC150 shall be used. For slopes less than 2:1, Model S150 shall be used.

2. Six inch wire staples shall be placed according to manufacturer’s recommendations to anchor the mesh material. Staples shall be designed to decompose.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

A. After approval of rough grading, loam shall be placed on areas affected by the Contractor's operations. Loam shall be at least 6-inches compacted thickness.

B. Lime shall be applied to bring the pH to 6.5 or, without a soil test, at the rate of 2-3 tons of lime per acre.

C. Fertilizer shall be applied according to the soil test, or without a soil test, at the rate of 1000 pounds per acre.

D. Loam shall be worked a minimum of 3-inches deep, thoroughly incorporating the lime and fertilizer into the soil. The loam shall then be raked until the surface is finely pulverized and smooth and compacted with rollers, weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades. Minimum depth shall be 6-inches after completion.

3.2 SEEDING:

A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April l and May 30 or August l5 to October l, unless otherwise approved.

B. If there is a delay in seeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.

C. Seed shall be sown at the approved rate, on a calm day by machine.

D. One half the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the soil to a depth of l/4-inch and rolled with a roller weighing not more than l00 pounds per linear foot of tread.

E. The surface shall be kept moist by a fine spray until the grass shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 sq. ft., the Contractor shall reseed, roll, and water as necessary to obtain proper germination.

F. The Contractor shall water, weed, cut and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.

G. If there is insufficient time in the planting season to complete the fertilizing and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor or as required by the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.

3.3 PLACING MULCH:

A. Straw Mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 4-1/2 tons per acre, or as otherwise required.

B. Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80 percent of the hay or straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.

C. Wood Fiber Mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise required. It shall be placed by spraying from an approved spraying machine having pressure sufficient to cover the entire area in one operation.

3.4 SEEDING AND MULCHING BY SPRAY MACHINE:

A. The application of lime, fertilizer, grass seed and mulch may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of lime, fertilizer, grass seed and mulch shall be equal to the specified quantities.

B. A certified statement shall be furnished, prior to start of work, to the Engineer and Landscape Architect by the Contractor as to the number of pounds of limestone, fertilizer, grass seed and mulch per 100 gallons of water.

C. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other methods.

3.5 INSPECTION AND ACCEPTANCE:

At the beginning of the planting season following that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at its own expense. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

END OF SECTION 32 91 19

SECTION 33 05 26.13 – TRACER TAPE

PART 1 - GENERAL

1.1 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.2 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.

B. Tape samples shall also be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.2 TRACER TAPE:

A. Tracer tape shall be at least 3-inches wide.

B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18-inches with ordinary pipe locaters.

C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.

D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER, "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30-inches to identify the pipe.

E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

Electric	Red
Gas & Oil	Yellow

Communications	Orange
Water	Blue
Sewer & Drain	Green
Chemical	Red (not APWA)

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12-inches below the proposed ground surface.

B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

END OF SECTION 33 05 26.13

SECTION 33 39 13 – PRECAST MANHOLES, CATCH BASINS, AND LEACHING BASINS

PART 1 - GENERAL

1.1 WORK INCLUDED:

This Section covers all precast manholes, catch basins, and leaching basins complete, including, but not limited to, bases, walls, cones, mortar, inverts, frames and covers.

1.2 RELATED WORK:

A. Section 31 00 00, EARTHWORK

B. Section 32 12 00, PAVING

C. Section 03 05 00, FIELD CONCRETE

1.3 SYSTEM DESCRIPTION:

A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as required by the Engineer.

B. All manholes and catch basins shall have concrete bases. Concrete bases shall be precast unless otherwise specified. Invert channels shall be formed of brick and mortar upon the base.

C. Catch basins shall have a 4-foot deep sump unless otherwise specified. Any leaching basins shall have a bottom opening as shown on the Drawings.

D. Riser and cone sections shall be precast concrete.

E. Leaching basins (i.e. drywells) shall have a bottom opening as shown in the drawings.

1.4 REFERENCES:

A. The following standards form a part of this specification as referenced:

ASTM International (ASTM)

ASTM	A48	Gray Iron Castings
ASTM	C32	Sewer and Manhole Brick
ASTM	C144	Aggregate for Masonry Mortar

ASTM C207	Hydrated Lime for Masonry Purposes
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C923	Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
ASTM C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M198	Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

Occupational Safety and Health Administration

OSHA 29 CFR 1910.27	Fall Prevention Protection

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer’s literature of the materials of this section.

B. Test reports as required by the Engineer.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE SECTIONS:

A. All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:

1. The wall thickness of precast sections shall be as designated on the Drawings, meeting the following minimum requirements:

Section Diameter (Inches)	Minimum Wall Thickness (Inches)
48	5
60	6
72	7
84	8

2. Type II cement shall be used except as otherwise approved.

3. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.

4. Minimum compressive strength of concrete shall be 4000 psi at 28 days.

5. No more than two lift holes may be cast or drilled in each section.

6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.

7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.

8. Circumferential steel reinforcement in walls and bases shall be a minimum of 0.12 sq. in./lin. ft. for 4-foot diameter sections and 0.15 sq. in./lin. ft. for 5- and 6-foot diameter sections. Reinforcing shall extend into tongue and groove.

B. Conical reducing sections shall have a wall thickness not less than 5-inches at the bottom and wall thickness of 8-inches at the top. Conical sections shall taper from a minimum of 48-inches diameter to 24 or 30-inches diameter at the top, as shown on the drawings.

C. Except where insufficient depth of cover dictates the use of a shorter base, bases shall be a minimum of 4 feet in height.

D. Slab top sections and flat riser sections (Grade Rings) shall conform to the contract drawings, with particular attention focused upon the reinforcing steel and be designed to meet or exceed an HS-20 Loading requirement.

E. The tops of the bases shall be suitably shaped by means of accurate ring forms to receive the riser sections.

F. Precast sections shall be manufactured to contain wall openings of the minimum size to receive the ends of the pipes, such openings being accurately set to conform with line and grade of the sewer or drain. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as required by the Engineer.

G. If applicable, any "Drop-over" manholes shall be placed where indicated on the drawings. The Contractor shall accurately measure the diameter of the existing outlet pipe and inform the manufacturer of its size, so that the "Drop-over" type opening can be cut into the precast manhole base. The bottom shall be cast in place by the Contractor in accordance with Section 03 05 00, FIELD CONCRETE. The invert channel shall be formed of brick and mortar, as specified in this specifications section. The sub-base shall be a compacted, level foundation of crushed stone, at least 6-inches thick, as specified in Section 02300 EARTHWORK, but shall vary to the depth necessary to reach sound undisturbed earth.

H. The exterior surfaces of all precast manhole bases, walls, and cones shall be given a minimum of one shop coat of bituminous dampproofing.

I. The Engineer reserves the right to reject any unsatisfactory precast section and the rejected unit shall be tagged and removed from the job site immediately.

J. The Engineer may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.

2.2 BRICK MATERIALS:

A. Brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Bricks shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.

B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.

C. Mortar shall be composed of portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as required by the Engineer and may vary from l:l/4 for dense hard-burned brick to l:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; portland cement to hydrated lime to sand.

D. Cement shall be Type II portland cement as specified for concrete masonry.

E. Hydrated lime shall be Type S conforming to ASTM C207.

F. The sand shall comply with ASTM C144 specifications for "Fine Aggregate," except that all of the sand shall pass a No. 8 sieve.

2.3 FRAMES, GRATES, COVERS AND STEPS:

A. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.

B. All castings shall be thoroughly cleaned and may be subject to a careful hammer inspection at the Engineer's discretion.

C. Castings shall be ASTM A48 Class 30B or better.

D. Manhole frames with 26-inch covers for 24-inch openings shall be 475 pounds minimum by EJ No. 2110 (formerly LK110A); Neenah Foundry Co. R1720; Quality Water Products, Style 40; or approved equal.

E. Catch basin frames and 23-7/8-inch square grates with 2-inch square openings shall be 8-inches in height minimum. They shall be Neenah Foundry Co. No. R3588-A; Quality Water Products No. 45-600; EJ 5548Z 5520M; or approved equal.

F. Catch basin frames set against curbing shall have three flanges only.

G. Manhole steps shall conform to ASTM C478 requirements and shall be fabricated of either extruded aluminum or steel reinforced plastic. Steps shall be uniformly spaced at a maximum of 12-inches unless otherwise shown on the drawings.

2.4 MANHOLE FALL PREVENTION SYSTEMS:

A. Where manholes exceed 20 vertical feet from the proposed rim elevation to the invert, manholes shall be provided with a fall prevention system. Fall prevention systems shall be in accordance with OSHA requirement 29 CFR 1910.27 and as described herein and as indicated on the contract drawings.

B. Carrier rail assembly shall be 1-5/16-inch O.D. by 1-inch ID Type 6061-T6 aluminum notched; 0.875-inches by 0.875-inches by 5/32-inch at 6-inch centers; tapped 3/8-inch at 9-inch centers opposite notches.

C. Manhole rung clamp assembly shall be constructed from 6061-T6 aluminum 11-inches long by 1.25-inches wide with 2 slots 7/16-inch by 1.25-inches at 9-inch centers and serrated on one side.

D. Safety locking mechanism shall be cast of manganese bronze with stainless steel springs and drop forged links and snap-locking pawl shall be minimum tensile strength of 110,000 psi. Roller bearing shall be killian type. Stainless steel springs shall comply with Military Specification QQ-W-423B.

E. Safety harness shall be adjustable to fit waists 30-inch to 48-inch. The belt shall be nylon web equipped with 3 stainless steel 'D' rings.

F. Fall prevention systems shall be manufactured by DBI/SALA, Safe Approach or approved equal.

2.5 LEACHING BASINS

A. Leaching basins shall be precast concrete with dimensions and details as shown on the drawings. Leaching basins shall be constructed using 4,000 psi concrete and ASTM GR.60 steel reinforcement and shall be manufactured to support AASHTO HS20 load.

B. All holes shall be cored and connections shall be made in accordance with the specifications for manholes.

C. Frames and covers shall be 26-inch cast iron frame and cover, H-20 load rated. The cover shall read DRAIN.

2.6 PLASTIC AREA DRAIN OUTLET STRUCTURES

A. Inline drain/drain basin designed for AASHTO H20 loading, with cast iron grate, as manufactured by Nyloplast America, Inc., or approved equal. Grates shall be lockable.

B. Couplings at the manhole-pipe interface shall be made with a rubber seal system (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection.

C. If specified on the drawings, any stubs to be installed shall be short pieces of the same class pipe as that entering the manhole and shall have either stoppers or end caps as shown on the drawings. Stoppers or end caps shall be especially designed for that application.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. PRECAST SECTIONS:

1. Precast bases shall be supported on a compacted level foundation of crushed stone, as specified in Section 31 00 00 EARTHWORK, at least 6-inches thick, but shall vary to the depth necessary to reach sound undisturbed earth.

2. Precast reinforced concrete sections shall be set vertical and with sections in true alignment.

3. Butyl rubber joint sealant shall be installed between each concrete section. Catch basin sections do not require joint sealant if so indicated on the Drawings.

4. All holes in sections used for handling the sections shall be thoroughly plugged with mortar. Mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense, and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

B. BRICK WORK:

1. Bricks shall be moistened by suitable means, as required by the Engineer, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

2. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as directed.

C. CASTINGS:

1. Cast iron frames, grates and covers shall be as specified. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings. Frames shall be adjusted to meet the street surface.

2. Cast iron manhole frames and covers not located in paved areas shall be set 6-inches above finished grade, at a height as required by the Engineer, or as indicated on the Drawings. The top of the cone shall be built up with a minimum of 1 course and a maximum of 5 courses of brick and mortar used as headers for adjustment to final grade.

3. Frames shall be set concentric with the top of the concrete section and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.

4. Covers and/or grates shall be left in place in the frames, for safety reasons, except while work is being performed.

D. ACCESSORIES:

1. Accessories shall be installed in accordance with the manufacturer’s instructions.

2. Stubs shall be set accurately to the dimensions indicated on the drawings. Stubs shall be sealed with suitable watertight plugs.

E. MANHOLE FALL PREVENTION SYSTEM:

Carrier rail shall extend from the manhole invert shelf to within 18-inches of finish grade. The rail and manhole rung clamp assembly shall be rigidly connected utilizing 3/8-inch stainless steel bolts. Assembly shall be clamped to manhole steps at 2-foot centers or as recommended by the manufacturer.

F. LEACHING BASINS

Leaching basins shall be set in an excavation lined with a geotextile non-woven filter fabric, such as Mirafi 140N or approved equal. The basin shall be placed on a pad of free draining crushed stone, with the excavation around the basin back-filled with similar material.

3.2 LEAKAGE TESTS:

A. Leakage tests shall be made by the Contractor and observed by the Engineer on each manhole. The test shall be by vacuum or by water exfiltration as described below:

B. VACUUM TEST:

1. The vacuum test shall be conducted in accordance with ASTM C1244. Test results will be judged by the length of time it takes for the applied vacuum to drop from 10 inches of mercury to 9 inches. If the time is less than that listed in Table 1 of ASTM C1244, the manhole will have failed the test. Test times from Table 1 are excerpted below.

TABLE 1

Minimum Test Times for Various Manhole Diameters

	Diameter (Inches)		
Depth (Feet)	48	60	72
		Times (Seconds)	
0-12	30	39	49
12-16	40	52	67
16-20	50	65	81
20-24	59	78	97
26-30	74	98	121

2. If the manhole fails the initial test, the Contractor shall locate the leaks and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. If the manhole should again fail the vacuum test, additional repairs shall be made, and the manhole water tested as specified below.

C. WATER EXFILTRATION TEST:

1. After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out. The test shall be made prior to placing the shelf and invert. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test.

2. The manhole shall be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above, is unsatisfactory as determined by the Engineer or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption by the manhole. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour loss rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as required by the Engineer to bring the leakage within the allowable rate of one gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for rejection of the manhole. It shall be the Contractor's responsibility to uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as required by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss of water during the test is a result of leaks through joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.

4. If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Engineer, such a test can serve to

evaluate water-tightness of the manhole. However, if the Engineer is not satisfied with the results, the Contractor shall lower the water table and carry out the test as described hereinbefore.

3.3 CLEANING:

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION 33 39 13

SECTION 33 41 13.22 – CORRUGATED POLYETHYLENE [HDPE] DRAINAGE PIPE

PART 1 – GENERAL

1.1 WORK INCLUDED:

A. This section includes furnishing all materials, labor and equipment and installing corrugated polyethylene [HDPE] drainage pipe and fittings as shown on the Drawings and as specified herein.

1.2 RELATED WORK:

A. Section 31 00 00 – EARTHWORK

B. Section 31 50 00 – SUPPORT OF EXCAVATION

1.3 REFERENCES:

A. The following standards form a part of this specification, as referenced:

ASTM International (ASTM)

ASTM D2321	Standard for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
ASTM F405	Standard Specification for Corrugated Polyethylene Pipe and Fittings

American Association of State Highway and Transportation Officials

AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer’s literature on the materials of this Section.

B. Manufacturer’s certification that the product was manufactured, tested, and supplied in accordance with this specification.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Pipe shall be packaged to withstand shipment without damage and handled carefully on the jobsite. Pipe shall be stored so that it is not exposed to sunlight.

PART 2 – PRODUCTS:

2.1 MATERIALS:

A. This Section applies to corrugated polyethylene pipe with an integrally formed smooth interior.

B. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe.

C. The pipe and fittings shall be free of foreign inclusions and visible defects. Fittings may be either molded or fabricated. Fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Engineer. The ends of the pipe shall be cut squarely and cleanly so as not to adversely affect joining.

2.2 MANUFACTURERS:

A. Pipe and fittings shall be manufactured by Ipex, Inc.; Plexco, Division of Chevron Chemical Co.; J-M Pipe Co.; Advanced Drainage Systems, Inc. (ADS) or approved equal.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned before installation. Pipes and fittings shall be maintained clean.

B. Pipes shall be installed in the locations and to the required lines and grades shown on the Drawings and provided in these Specifications, using an approved method of control.

C. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there by any joints made up in water.

D. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.

END OF SECTION 33 41 13.22

SECTION 33 56 13 – ABOVEGROUND FUEL STORAGE TANKS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section covers furnishing and installation of two (2) 6,000-gallon aboveground storage tanks (ASTs). Tanks shall be protected type, double wall steel with secondary containment, vehicle impact protection, and projectile resistance. This section also covers the fill piping with spill containment (capable of returning the product to the AST), vent piping with vent caps, associated fuel piping, stage I vapor recovery, and all materials and accessories necessary to make a complete installation ready for use as described herein and as indicated on the Drawings.

B. The Contractor shall furnish all labor, materials, equipment, appliances, services and hauling, and perform operations in connection with the construction and installation of the gasoline tank installation. Work shall be as herein specified and as denoted on the accompanying Drawings.

1.2 RELATED WORK

A. Section 31 00 00, Earthwork

B. Section 28 40 00, Fuel Dispensers and Fuel Management System

C. Section 28 09 50, Fuel Dispenser and Management System

D. Division 26, Electrical

E. Section 03 30 00, Cast-in-Place Concrete

1.3 QUALITY INSURANCE

A. Installation Contractor shall be certified in writing by the manufacturer. The Contractor shall, prior to any installation, submit copies of such certification to the Fire Chief at the local Fire Department and to the Engineer.

B. All additional certificates and test reports specified herein shall be submitted to the Engineer.

C. Protected tanks shall be double-wall steel and provide secondary containment by an impervious steel outer wall, UL labeled, constructed to meet governing standards with certification plate (UL Label) affixed and manufactured in the USA.

D. Protected tanks shall be designed and manufactured of steel or its equivalent in accordance with approved engineering standards.

E. All tanks shall be equipped with an overfill prevention and shall meet NFPA 30 and NFPA 30A requirements.

F. The Contractor shall notify Owner and Fire Department in advance of setting date of ASTs to view pre-installation testing.

G. All ASTs, equipment, and piping materials shall be physically inspected, and pressure tested before being installed. Any defects observed shall be immediately brought to the attention of the Engineer. It shall be the sole responsibility of the Contractor to correct any deficiencies with the manufacturer, in strict accordance with manufacturer’s' recommendations, at no additional cost to the Owner.

H. The Contractor shall be a licensed AST installer in the Commonwealth of Massachusetts, and certified by the AST manufacturer, during the entire duration of the project. The Contractor shall have the responsibility of notifying and coordinating with all local and state officials, including the local Fire Department. The Contractor shall pay all inspection, permit, testing, and registration fees in order to provide a complete and fully permitted and operational system along with obtaining the required registrations and permits. The Contractor shall provide a written site safety plan.

I. Contractor shall secure all permits necessary for the installation and operation of the fuel system including permits from the state building department. The contractor shall also test the gasoline Stage 1 EVR system and register with the DEP. The Contractor shall document the results of the Stage 1 vapor system and submit to the Engineer for record purposes.

J. The system shall be explosion proof and grounded in accordance with local, state, federal and manufacturer’s requirements.

1.4 REFERENCES

A. The following standards form a part of this specification and indicate the minimum standards required:

American National Standards Institute (ANSI)

ANSI B1.20.1	General Purpose Pipe Threads

American Society for Testing Materials (ASTM)

ASTM D1248	Polyethylene Plastic Molding and Extension Materials
ASTM D1785	Polyvinyl chloride (PVC) Plastic Pipes, Schedules 40, 80 and 120.
ASTM A53	Pipe, steel, black and hot-dipped, zinc coated welded and seamless.
ASTM D2996	Filament Wound Reinforced Thermosetting Resin in pipe.

Underwriters Laboratories, Inc.

UL 142	Steel Aboveground Tanks for Flammable and Combustible Liquids
UL 971	Non-metallic pipe and UL Standard 567-89 pipe connections for flammable and combustible LP gas
UL 1709	Rapid Rise Fire Tests of Protection Materials for Structural Steel
UL 2080	Fire Resistant Tanks for Flammable and Combustible Liquids
UL 2085	Protected Aboveground Tanks for Flammable and Combustible Liquids

National Fire Protection Association (NFPA)

NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages
NFPA 70	National Electrical Code
NFPA 78	Lightning Protection Code

The American Welding Society (A.W.S.)

A.W.S.	Standard for continuous weld

Uniform Fire Code (UFC)

UFC 1997	Protected" AST criteria as per Appendix II-F, including ballistics protection.

California Air Resources Board (CARB)

CARB	Testing requirements for air emissions.

Southern Building Code Congress International (SBCCI)

SBCCI	Standard Fire Prevention Code.

Building Officials and Code Administrators (BOCA)

BOCA 1993	National Fire Prevention Code.

B. All tanks and piping shall be properly installed in accordance with the manufacturer's instructions and "Petroleum Equipment Institute Publication RP200; Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling".

C. Where differences exist between standards, the Contractor shall use the most conservative. If in doubt, describe differences in writing to the Engineer for his approval before performing the work.

D. The codes and standards listed are the latest as of this publication. Codes and standards are continuously updated. The Contractor shall confirm the construction standard edition enforced by the authority having jurisdiction.

E. Tanks shall be warranted for a minimum period of 30 years against failure due to internal/external corrosion or structural failure. Warranty shall start at the date of substantial completion.

F. Tanks shall also meet all State requirements including 527 CMR 1.00 and 527 CMR 5.00.

1.5 SUBMITTALS

A. Shop drawings, details, data sheets, and other descriptive drawings and materials as may be required to fully describe the equipment proposed and verify conformance with the contract documents. Drawings shall include all critical dimensions, locations of fittings and accessories, i.e.: man-way, secondary containment, etc.

B. Shop drawings of the tank(s) by the tank manufacturer including product data sheets and descriptive material for major components to be provided.

C. Assembly and installation drawings.

D. Manufacturer's literature/O&M manual including manufacturer's current installation instructions.

E. Submittals shall be delivered to the Engineer within 10 days of Notice to Proceed. The Engineer shall review the drawings and return them to the Contractor approved, or with appropriate comments.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The two (2) 6,000-gallon rectangular aboveground, protected storage tanks shall be double walled steel and UL 2085 listed as manufactured by Highland Tank and MFG. CO. (Paul Stringfellow, Kennedy Petroleum 800-451-4021), or approved equal.

B. The primary product pipe shall be as manufactured by Wheatland Tube Company of Sharon, PA, or approved equal.

2.2 FUEL STORAGE TANKS – GENERAL

A. Provide two (2) protected, aboveground storage tank (AST) with secondary containment, fittings and accessories as denoted on the drawings. Nominal capacity of both tanks shall be 6,000 gallons. Nominal dimensions of both tanks shall be: 17-feet-7-inches x 8-feet x 6-feet-11-inches (L x W x H) and they both shall have 24-inch diameter manways per Drawings. The tanks shall be chemically inert to petroleum products and shall be capable of storing gasoline fuel, diesel fuel, and bio-diesel up to B20, alcohol blended gasoline (with up to 100% methanol or ethanol), with or without water bottom, at ambient temperatures with specific gravities of up to 1.1.

B. The tanks shall be designed to support accessory equipment as denoted on the drawings when installed according to manufacturer’s recommendations and limitations. In addition to all equipment and standard operating loads, the tanks shall be designed for a ground snow load of 80 psf, or shall meet local/state building codes, whichever is greater.

C. The tanks shall be designed for aboveground storage of flammable and combustible liquids at atmospheric pressure. Tank shall include integral steel secondary containment and thermal insulation that provides a minimum two-hour fire rating. Each tank shall be delivered as a complete UL-listed assembly with two factory supplied, welded-on saddles. Size and location of saddles shall be as required by Highland Tank. Saddles to be set level on a solid foundation. Tank shall be designed for possible relocation at a future date. Tank shall comply with the latest edition of National Fire Protection Association NFPA 30 Flammable and Combustible Liquids Code. The tank’s secondary containment must be tested for tightness in the factory and in the field before commissioning. Tank shall be supplied with emergency vents for the primary and the secondary containment tanks. Emergency venting by "form of construction" is not equal and will NOT be permitted.

D. Inner and Outer Tanks shall be manufactured in accordance with UL-142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids. Entire tank shall be labeled for Underwriters Laboratories UL 2085 Standard for Insulated Secondary Containment Aboveground Tank for Flammable Liquids. The tank design shall comply with UL 2085 "Protected" Tank standard and shall be tested for Ballistics, Impact, Hose Stream, and Pool Fire UL-2085 performance standards. Tank shall be manufactured and labeled in strict accordance with Steel Tank Institute (STI) Fireguard® Thermally Insulated, Double Wall Steel Aboveground Storage Tank standards as applied by a licensee of the STI. Tank shall be subject to the STI’s Quality Assurance program and shall be backed by the STI 30-year limited warranty.

E. Tanks shall be fabricated per UL-142 of mild carbon steel with shell seams of continuous lap weld construction. Tank shall be of double wall construction and provide complete secondary containment of the primary storage tank’s contents by an impervious steel outer wall. A 3-inch minimum thickness of porous, lightweight monolithic thermal insulation material shall be installed at the factory within the interstitial space between the inner and outer wall. Thermal insulating material:

1. Shall be in accordance with American Society of Testing Materials (ASTM) Standards C-332 and C-495.
2. Shall allow liquid to migrate through it to the monitoring point.
3. Shall not be exposed to weathering and shall be protected by the steel secondary containment outer wall.

F. Lifting lugs shall be provided at balancing points to facilitate handling and installation.

G. Threaded fittings with thread protectors shall be supplied as follows for each AST being installed (all fittings must be located on tank top per UL):

1. One (1) 2" - Interstitial Monitoring.
2. One (1) 2" - Normal Vent, Primary Tank.
3. One (1) 4", 6", or 8" - Emergency Vent, Primary Tank.
4. One (1) 4", 6", or 8" - Emergency Vent, Secondary Tank.
5. One (1) 4" or 6" - Product Fill.
6. One (1) 4" - Product Pump or Supply.
7. One (1) 4" - Product Return or Auxiliary (3,000 gal. and larger).
8. One (1) 4" - Liquid Level Gauge.
9. One (1) 4" - Stage 1 Vapor Recovery, Electronic Level Stage 1 Gauge, or Auxiliary (4,000 gal. 8’0" diameter and larger).
10. One (1) 24" Manway (min.) with emergency vent (4,000 gallons and larger).

Provide additional fittings as required for a complete and operable system. Provide all fitting/appurtenance needed to meet current DEP EVR Stage I vapor recovery requirements.

H. Installation and testing shall be in strict accordance with Steel Tank Institute Installation and Testing Instructions for Thermally Insulated, Lightweight, Double Wall Fireguard® Aboveground Storage Tanks.

I. The exterior of the tank shall be protected with a three part exterior coating. The protective coating shall be comprised of Chemzinc 1000 (zinc-rich polyurethane primer), Chemprime 3001 (corrosion Resistant epoxy primer) and a finish coat of Chemthane 3300 (Acrylic polyurethane coating). Final coating shall be white to meet the current Stage I vapor recovery requirements.

J. Tanks shall be manufactured to provide positive drainage on top of tanks, to allow water to shed off the top of the tanks.

2.3 PIPING SYTEM

A. Fuel piping shall be 1-1/2-inch minimum Schedule 40 carbon steel pipe per manufacturer recommendations and painted in accordance with manufacturer recommendations to protect it from corrosion for outdoor use, in a color chosen by the Owner.

B. Vent pipes shall be installed as shown on the Drawings. They shall be carried up to a point not less than 12 feet above the ground level at the filling point of the tank, shall terminate not less than 5 feet from any door or window opening, and shall be fitted with an approved weather hood screened with noncorrosive wire not coarser than 30 mesh, along with Stage I pressure/vacuum fittings.

C. Tank(s) storing class IB liquids (gasoline) shall be atmospherically vented to prevent development of vacuum or pressure, with Stage I PV fittings.

D. All aboveground tanks shall have emergency relief venting that will relieve excessive internal pressure caused by an exposure fire. This requirement shall also apply to the interstitial space of the secondary containment tank. Vent types and size shall be in accordance with NFPA, manufacturer, and UL listing requirements.

E. All metallic piping, fittings, and valves used in connection with approved nonmetallic piping, fittings, and valves shall be grounded in accordance with local and state regulations, and manufacturer's recommendations.

F. Pipe and fittings smaller than 2-inches shall be carbon steel. Pipe joints shall be threaded pipe and fitting threads and shall conform to ANSI B1.20.1.

G. All fittings shall be Schedule 40, minimum.

H. Brass seated unions shall be installed where deemed necessary by the Engineer for future maintenance and repairs.

I. Entire fuel system shall be grounded per State and Federal requirements.

J. The gasoline tank shall be installed with Stage I Vapor Recovery and all fittings/equipment necessary to meet MassDEP and Federal Regulations.

2.4 ACCESSORIES

A. An electric level gauge and monitoring system shall be provided for each tank, with remote reading located as shown on the Drawings, and in Section 28 40 00 Tank Gauging Instrumentation and Control.

B. A hardwood dipstick shall be provided for each tank of appropriate length for local level readings.

C. System shall be complete with valves to prevent all siphoning of fuel.

D. Overfill protection shall be provided by the following methods:

1. Overfill prevention valve as manufactured by OPW or approved equal. Direct reading level gauge visible from fill pipe access. Visual level clock gauge shall be as manufactured by Morrison, Inc. or approved equal and located near the fill port for easy monitoring.

E. Each tank shall be equipped with a 10-gallon remote fill box. The units shall include the following:

1. Box and Door with Legs: 304 Stainless Steel
2. Stainless Steel Ball Valve
3. Stainless Steel Quick Disconnect Coupler and Plug
4. Stainless Steel Check Valve
5. Anodized Aluminum Quick Disconnect Adaptor and Cap
6. Stainless Steel Dry Disconnect Adaptor and Cap
7. Vapor Recovery Kit (Gasoline Tank Only)

8. Remote Fill Box shall be as manufactured by Morrison Bros. Model 715 Series or approved equal
9. Hand Pump Assembly

F. The fuel port and fill piping for the ASTs shall be 3-inch minimum and shall come equipped with a drop tube which will deliver fuel to the bottom of the tanks in accordance with manufacturer recommendations and NFPA requirements. In addition, the fill pipe shall be equipped with an overfill prevention valve rated for pump deliveries which will automatically shut the flow of fuel off to the tanks at a pre-determined height, overfill prevention valve shall be OPW 61 F Stop or equal. The tank vent diameter shall be at least as big as the tank fill pipe. Contractor shall notify engineer when overfill prevention valve is being installed.

G. The product level and interstitial space shall be monitored in accordance with Section 28 40 00 Tank Gauging Instrumentation and Controls.

H. The fill pipes and vapor recovery piping shall be equipped with poppet valves so the tank can be tested for stage I vapor recovery with the cap off per DEP EVR standards. Components for the State and/or CARB compliant EVR systems shall be as outlined in Executive Orders VR-401-E or VR-402-D.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Manufacturer will have a minimum of 5-years' experience in producing specified tanks for commercial use and document at least 10 installations in satisfactory operation.

B. The tanks shall be installed in accordance with manufacturer's recommendations and in accordance with local, state, and federal regulations.

C. Tanks shall be installed on a reinforced concrete base slab, as detailed on the Drawings, designed to support the fully loaded tank.

D. Tanks shall be marked on all sides with warning signs per local, state and federal requirements including, but not limited to: "FLAMMABLE" or "COMBUSTIBLE", "NO SMOKING", product identification and other signs as required by Local, State, and Federal regulations.

E. Electrical work shall be in accordance with applicable codes, including NFPA, and shall be rated for a hazardous area as required. Electric feed for dispensing pumps shall include an emergency shutoff switch located a minimum of 20-feet, maximum of 100-feet away per code requirements. Tanks shall be electrically grounded in accordance with NFPA 78. All electrical work shall be performed by a MA licensed electrician.

F. The system installation shall be inspected and approved by the system supplier. The system supplier shall submit a comprehensive checklist of quality and safety items critical to the system and verify that the installation has been in accordance with these standards and applicable Local, State, and Federal regulations.

G. Monitoring systems shall be installed as indicated in Section 28 40 00 Tank Gauging Instrumentation and Controls.

H. The Specifications and Drawings indicate the general components of the fuel system only and the Contractor shall be responsible for providing all other materials, equipment, components, and labor as needed to provide a complete, code compliant and operational system. All components of the system shall be coated or otherwise protected as approved by the Engineer to prevent corrosion and all components shall be waterproof and rated for use in an outdoor environment (weatherproof).

I. The entire fuel system, including components specified in other sections, shall have a one-year warranty guaranteeing the system shall operate trouble free for one year starting on the date of substantial completion. The Contractor shall be responsible for performing all repairs and replacing equipment/components as necessary during the warranty period to ensure trouble free operation at no additional cost to the Owner.

J. The gasoline tank shall be equipped with Stage I vapor recovery equipment so that vapors can be collected during tank filling, meeting DEP EVR regulations. The Tank shall be painted white per manufacturer's requirements.

K. The Contractor shall train the Owner in the use of the Fuel System.

3.2 TESTS

A. The tank and piping shall be inspected for damage and external defects, tested for tightness.

B. Tanks and piping shall be pressure tested as specified on sheet EQ203 construction notes 5&6 respectively.

C. All equipment necessary to perform the required tests shall be furnished by the Contractor. Contractor is responsible for coordinating the testing with the fire department and obtaining necessary approval to allow the system installation and operation.

D. Owner shall be responsible for furnishing initial fuel delivery for initial startup and testing. Contractor shall coordinate with Owner at least 1 week in advance of testing and start up to allow time to order fuel.

END OF SECTION 33 56 13